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CONTENTS

*Illustrated.

ANOTHER rear collision, killing twenty-three passengers, once more brings down on the New Haven road showers of angry denunciation, not only from yellow journals, but from others, more conservative, as well. The main question, that of the observance of signals by the engineman, cannot be considered at this time, as not enough evidence has been gathered. Neither can the flagman's conduct be criticized, for the question whether he could or should have gone back farther can be answered only after a careful investigation, which at this writing has not been made. But the reiterated denunciation of the "old wooden cars" calls for a word in defense of the road and of the Pullman Company, owner of the cars. In no line of improvement has there been more rapid progress during the past five years than in substituting steel for wooden passenger cars. This has been done at great expense and in spite of the fact that the steel car is not ideal. In a violent collision an immense momentum has got to be destroyed in some way. A collision between two all-steel trains, one or both moving rapidly, is bound to wreck something. This test has never yet been made. The Pullman Company has built steel cars rapidly. Could it serve the public better and with reasonable economy by at once destroying hundreds of sound wooden cars? Such destruction, by Pullman and all the roads, seems to be what the clamorous editors and congressmen demand, ignoring the question of cost, which involves hundreds of millions of dollars. And if wooden cars are to be tolerated at all, at any time, they must be used in the rush of travel following Labor Day, when every available car must be put in service. These difficulties of the car problem serve once more as a reminder that the vital issue is the prevention, not the mitigation of collisions.

THE enclosed disk signal also furnishes food for columns of criticism by the newspapers, and the fact that the railroad had decided to put in semaphores in place of the disks on the New Haven-Springfield line is taken as conclusive condemnatory evidence. In justice to the first class roads which have used disks extensively for 20 years, and with a high degree of safety, it should be said that these signals have been and are used on lines traversed by the fastest trains in the world, where trains are not only fast but frequent. The last government report showed 3,615 miles of track thus signaled. At night the question of disk versus semaphore has no weight, as the light constitutes the signal. The North Haven collision occurred at 7 a. m. in a dense fog, and quite likely the engineman saw the light before he saw the daylight signal. Railroads instal semaphores so as to make the automatic signals uniform in aspect with the signals at junctions, and so as to have a three-position signal, which also is desirable on account of uniformity and economy; but the denunciation of the disk, because it is a disk, is based largely on tradition and sentiment. The argument that a semaphore is distinguishable at a greater distance may be admitted; but that is not a vital issue. In the North Haven case the question of visibility at a distance is likely to prove wholly immaterial, for nothing could be seen more than about 300 ft. away, on account of the fog. We pointed out last March (page 657) the illogical character of the Connecticut Commission's recommendation to abandon disks.

WILLIAM W. WHEATLY, in reading a paper on Railroad Economics, before the American Association of Railroad Superintendents (the meeting of which was commented on at some length last week), reiterating an old fallacy, rather ludicrously emphasized the author's unfitness for discussing "railroad economics." Mr. Wheatly says, in speaking of the increase in the funded debt of railroads:

> The rapid progress of invention and discovery and the natural waste of wear and tear have made it necessary about every 20 years to rebuild and reequip the entire system. Almost the entire cost of each one of these cycles of improvement has been paid for with money freshly borrowed from the public. The total indebtedness of the railroad system [Baltimore & Ohio] today includes practically all of the plant and equipment that have been consumed since the beginning in 1827. As the old mortgage debts fell due, they were refunded by creating new and larger mortgages.

Apparently Mr. Wheatly has no conception of the meaning of *fixed capital.* He goes on to enlarge on the idea that these new mortgages refunding former mortgages are drawn up on property which no longer exists. The absurdity of this is apparent if we translate the Wheatly argument into a concrete example. A mortgage is made covering 100 miles of line. This line is repaired currently from earnings. As ties wear out, new ties are placed in track, and their cost is charged to the operating expenses of the current year. The same is true with rails and every other part of the line. Fifty years from the date of the first mortgage a new mortgage is drawn up secured on the property as it then is, and the proceeds from the sale of the bonds under this new mortgage are used to pay off the matured bonds

issued under the old mortgage. Not even the most ardent of railroad sympathizers would dare claim that during the 50 years the road should have earned enough not only to pay for the upkeep and replacement in kind of its property, but to pay off to its security holders interest and principal as well. The amortization of a debt is proper where the security for the debt is to be allowed to run down and eventually become worthless; but in the case of a railroad, maintenance charges paid from current earnings are themselves an amortization, and the only reason that railroad mortgages are drawn for larger and larger sums is that the railroad properties are not only being maintained and replaced in kind, but are being added to by new improvements as well. In picking out the Baltimore & Ohio Mr. Wheatly chose an example that in recent years has been particularly unsuited for his purpose. One of Mr. Willard's first acts on the Baltimore & Ohio was to write off—subtract from the profits—over $8,000,000 for equipment which had become, in his opinion, obsolete without having been replaced.

ONE of the best examples of the continual change in railway conditions is afforded by the remarkable development in railway facilities that is taking place in the Northwest and the vigorous contest that is being waged there between the big systems. Until about seven or eight years ago the Hill lines, the Great Northern and the Northern Pacific, were almost alone in the vast territory from the Missouri river to the Pacific coast north of the southern boundaries of Washington and Montana. The first serious invasion was that of the Chicago, Milwaukee & St. Paul, whose coast extension traverses territory formerly served exclusively by the Northern Pacific and parallels the older road for many miles. Shortly after the construction of the St. Paul's coast extension the Harriman lines forced an entrance from Portland north into Tacoma and Seattle over the tracks of the Northern Pacific, and followed this with the construction of the North coast line into the Yakima Valley and a new line south from Spokane towards Portland. The Hill lines have also been on the offensive, having built the Deschutes line into central Oregon, a territory previously served only by the Harriman lines, and followed this by the construction of the Oregon Electric down the rich Willamette Valley, which always has been a Southern Pacific stronghold. In eastern Washington and Montana the contest has been waged principally between the Hill system and the St. Paul, although there have been rumors of an invasion of eastern Montana by the Soo line. One of the most important developments in this vicinity is the new terminal of the St. Paul at Spokane, which is now nearing completion. When this is in operation the St. Paul will be a very active competitor for traffic both east and west, as it will be the short line between important points. The advantage the road derives from this circumstance has been increased by the location of its freight and passenger facilities closer to the business section of Spokane than the previously existing facilities. In Montana the St. Paul is building a line from Lewistown northwest to Great Falls, a distance of 137 miles, and an additional distance in the same direction of 68 miles parallel to the Billings—Great Falls line of the Great Northern. The Great Northern, on the other hand, is building a long line from Lewistown east into North Dakota north of the St. Paul's main line, which is obviously intended to keep the latter road out of this country. While the rivalry is most pronounced in the west, the Hill lines have also been forced to meet new competitors in Minnesota. Only a few years ago the Soo built a line from Thief River Falls, Minn., west into North Dakota, cutting across a territory already served by the Great Northern, while last year the same road completed a short line from St. Paul to Duluth, making it an active competitor for this business. In its turn, the Great Northern built a line from Fargo, N. D., norhwest to Surrey last year, which closely parallels the main line of the Soo. All of these projects indicate the intense rivalry between the large railway systems in the Northwest, and the effect of competition is stimulating railway construction in undeveloped territory—perhaps in many cases well in advance of the actual requirements.

CAR POOLING UNDER GOVERNMENT OWNERSHIP.

EVERYBODY'S MAGAZINE for September publishes an article in favor of pooling of freight cars. The method proposed is that the government shall purchase all the freight cars and rent them out to the railways. The article is entitled "Uncle Sam's Freight Cars," and is written by J. Garrett Hill, who is introduced by the editors as "an expert," and "Commercial Agent of the Queen & Crescent Route."

There is a great deal to be said in favor of the pooling of freight cars, and there is also a great deal to be said against it, but the subject is one which should be handled with a great deal of care. Arguments on both sides should be carefully weighed and should be based upon facts.

The article in question is unfortunately based upon a series of misconceptions. The author proposes that the government, in buying the freight cars, shall pay for them $800 each. Its rate of rental to the railways is to be on the basis of 50 cents per car per day, plus one cent a mile run. This is an advance of over 50 cents above the present per diem rate. At these high rates the author correctly states that the government could keep the cars in repair and make quite a good deal of money, but unfortunately he understates the cost of upkeep and operation, and as a result he shows profits for the government which are extraordinarily large. For instance, he estimates the cost of upkeep and operation of all the freight cars in the country as $80,000,000 per year. Now, the mere repairs to freight cars, as reported to the Interstate Commerce Commission for the year 1910, amounted to over $137,000,000; and this does not cover renewals or depreciation.

Suppose that the government did purchase all the freight cars in the country; how would it get a right to hire them out to the railways at such an extortionate rate as to insure it a large profit on the transaction? Would not this be confiscation of the worst kind?

Mr. Hill states that railway earnings would be increased, for "sufficient equipment could be had at all times by the railways, while under the present system the loss to the railways through lack of equipment is enormous." How would this result be accomplished? It might be accomplished if the government's method of distributing cars was vastly better than the present method of the railways, but Mr. Hill is absolutely silent as to the methods which the government should pursue.

The author arranges that the government shall spend $1,000,000,000 for storage yards for its cars. Just why this enormous expenditure is necessary he does not say, nor whether the storage yards are to be built new, or are to be bought from the railways. Apparently, they are to be built new, as the author does not speak of the advantage which the railways would secure in receiving this $1,000,000,000 from the government. He does suggest that the $2,000,000,000 which the railways would receive for the cars would be useful to increase their terminals, and would meet all demands for improvements for years to come. In view of the recent increases in the capital of the railways, and others that are needed, it is to be feared that the $2,000,000,000 would not last many years.

The author points out that if the Pennsylvania System were to sell its cars to the government it would receive over $197,000,000, which is a large amount of money; but he does not say why the Pennsylvania should be willing to part with its equipment, even at a liberal valuation, if it were to be obliged to hire equipment at a rate more than 50 per cent. in excess of what it is now paying.

It is true that the use of freight cars indiscriminately, without regard to their ownership, would be an economical arrangement for the railways taken as a whole, but unless such a plan is surrounded by safeguards, which have not as yet been devised, and which certainly are not suggested by Mr. Hill, such

a plan would work an injustice on the originating roads in times of car shortage, and would work further injustice on the distributing roads in times of car surplus.

So far all efforts toward progress in the direction of pooling have been blocked, on the one hand by the railways owning a large number of cars which insist on controlling their own equipment, and on the other hand, by roads which are profiting by the present arrangement. The combination of these two classes of roads has been strong enough to hold matters very much as they are, and articles like Mr. Hill's, which give bad reasons for good results, are likely to retard the achievement of these results.

INCREASING THE EFFICIENCY OF EQUIPMENT.

FROM a purely economic standpoint the most important problem confronting the railway officers of America is that of securing a more satisfactory ton mileage per day and per year from each freight car and locomotive. The power of locomotives and the capacity of cars have been increased greatly within the last decade. The ton mileage moved per locomotive and per car has not been increased in proportion. The *Railway Age Gazette* is publishing a series of discussions on the subject, "Getting More Movement for Freight Cars." The first article, which was by Arthur Hale, general agent of the American Railway Association, appeared in the issue of August 1, page 175. In the issue of August 29 we published an article on the same general subject by B. A. Worthington, president of the Chicago & Alton, also a letter from Mr. Hale on "Car Movement and Interchange." This week we publish articles on car movement by F. M. Lucore, assistant general manager of the Sunset Central Lines, and E. H. DeGroot, Jr., superintendent of transportation of the Chicago & Eastern Illinois.

The subject is really a broader one than merely that of getting more movement from cars. As already indicated, the real problem is that of getting more ton mileage from each engine and car. There are numerous things which must be done if equipment is to be worked with the maximum practicable efficiency. In the first place, as is generally recognized by those acquainted with the situation, the co-operation of the shipping public must be secured. The most economical way to increase the efficiency of equipment is to increase the size of the average load hauled per car. In this way the total amount of traffic handled may be augmented with no corresponding addition to investment in equipment, main tracks and yardage, or to operating expenses. It is well known that the average tons hauled per car have not increased anywhere near as much in proportion as has the average capacity per car, and it is very doubtful if substantial increases can be made in future in the average car load without increases being made in minimum carload weights. It ought to be possible, by co-operation between the railways and the shippers, to bring about increases in minimum weights which would not be unduly burdensome to commercial interests.

The movement per car per day can be increased by reducing the time that cars are held for loading and unloading. The maximum free time ordinarily allowed for these purposes is 48 hours. The demurrage assessed thereafter is regarded by some as a charge for the rendering of a service; by others, as a penalty for keeping cars out of service. If it is a charge for the rendering of a service it ought to be large enough to cover the cost of the service and a reasonable profit. On this theory, the prevalent demurrage rate of $1 per car per day is inadequate. The average earnings per freight car per day are about $2.50—in 1912 they were $2.57. Therefore, while a car is kept out of service accumulating demurrage the railway is receiving a smaller return from it than when it is being used to move freight. The prevalent demurrage charge is also too small if considered as a penalty. The purpose of a penalty is to prevent people from doing the thing for the doing of which the penalty is imposed; and the reports of the demurrage bureaus show that shippers and consignees hold many cars in excess of the period of free time, and that this is one of the main causes of the small average movement per car per day. The obvious remedy, whether demurrage be a charge or a penalty, is to increase the demurrage rate. Probably in no other country is the demurrage rate so low as in the United States in proportion to the capacity of cars. In the long run the public as well as the railways would benefit by the increase in car efficiency that would result from putting the demurrage rate on a more reasonable basis.

In recent years, when shippers have complained about car shortages, the spokesmen of the railways have very frequently reminded them that the delays to cars caused by shippers themselves are among the main causes of such conditions. But railway officers have not blinded themselves to the fact that there are many preventable delays to cars while they are in the hands of the railways, and they have been devoting much study to the causes of these and much thought and energy to devising and applying methods for reducing them. The articles on the subject which have been appearing in the *Railway Age Gazette* have pointed out many of these causes and told of some of the remedies that are being applied. The fact that stands out very prominently, however, that in spite of all the investigating that has been done and the efficiency methods that have been tried, the average mileage per car per day and the average ton mileage per car per day in the entire country have not been materially increased.

The discussions of the subject and the statistics relating to it show that while we know a good deal about where the delays to cars occur and the causes of them, we still know far too little about these things. We know that most of the delays occur at stations and in yards; but why, when we know this, do so many preventable delays continue to occur there? There are many answers to this question, but before it shall be satisfactorily and fully answered it will be necessary to have far more thorough investigations made than as yet have been undertaken. One of the most important prerequisites to the solution of the problem of car efficiency is to have the causes of delays on every railroad, and at every station and yard on every railroad, investigated and reported in minute detail.

This searching investigation must be followed by an equally thorough and detailed application of the remedies that it suggests. We already know that one of the pressing needs on most roads is the enlargement and improvement of station and terminal tracks. The delays to cars on many roads are chiefly due to the fact that they are being maneuvered on too restricted a trackage. The needed expansion of station and terminal facilities can be secured only by the investment of large amounts of capital, and the difficulties in the way of raising this new capital are familiar. But while an enlargement of station and terminal trackage would afford opportunity for increasing car efficiency, it would not of itself increase it. In order to get the maximum practicable ton mileage per car per day it will be necessary, no matter what physical facilities are provided, to devise better means for following and stimulating the movement of cars from the moment that they are put under load until the moment they are delivered to the railway unloaded; and in any state of the physical facilities the use of such means will increase car efficiency.

Aside from the development of terminal facilities, the means requisite to increasing the efficiency of the use of equipment may be summed up in two words. These words are "increased supervision." Increased supervision is needed in the operating departments of most railways, from the office of the president down to the offices of the trainmaster, the yardmaster and the train despatcher. Most railways are under-officered, especially in the lower ranks, and a few of them are so organized and officered as to enable the officers on the firing line—the superintendent, the trainmaster, the traveling engineer, the yardmaster, the despatcher—to get the maximum efficiency from train employees and equipment. It is probable that there are few railroads that could not increase the efficiency of train employees, of locomotives and of cars, and thereby reduce their operating expenses, by in-

creasing the number of officers employed to exercise direct and detailed supervision over the movement of equipment and the work of all employees concerned with train operation.

BRIDGE ERECTION UNDER TRAFFIC.

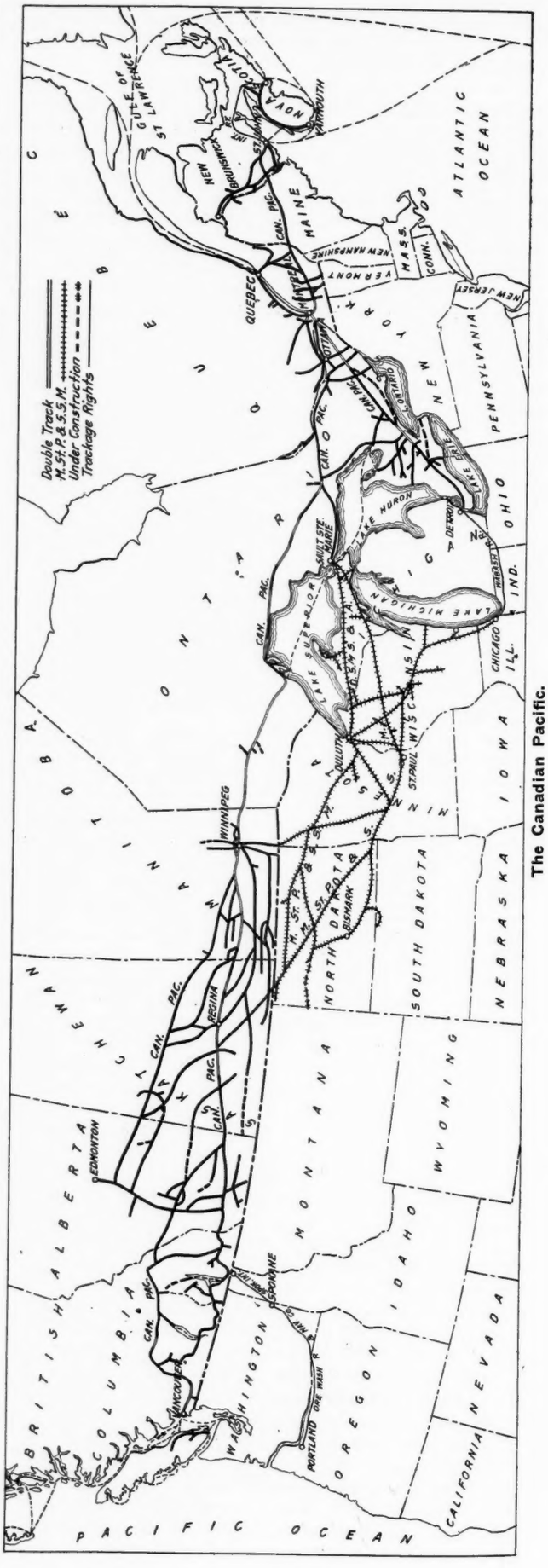
ALTHOUGH difficult problems are frequently presented by the necessity for renewing bridges under traffic, and unusual methods are sometimes adopted for handling such work, most of these methods would seem very simple in comparison with the elaborate system which was worked out and successfully used for building the new Ohio river bridge of the Norfolk & Western. For reasons stated in the description of this work elsewhere in this issue, it was essential that the new bridge occupy the same location and have the same span lengths as the old structure, and as 60 to 70 train movements a day were being made over the gauntleted track on the bridge it was impossible to use any method of erection which would require holding this track even for short periods. By delivering all material used in the alterations to the piers on barges on the river, and by handling the steel for the new superstructure on temporary tracks supported on cantilevered brackets outside the new trusses, the use of the main track on the bridge for construction purposes was limited to an occasional movement of the work engine with cars of steel or equipment for use on the other end before the material tracks were completed for the full length.

In working out the details of this plan many difficulties had to be anticipated and provided for to keep the cost of the work within reasonable bounds, and to prevent accident. The problem of designing the new trusses so as to carry the temporary material tracks without too greatly increasing the cost was solved by using the stringers intended for the new bridge on temporary brackets cantilevered out from the end of the new floor beams. By allowing the traffic to use the old track structure until all the steel in the new bridges had been erected these stringers could be taken from the temporary track and placed in the permanent deck so that the only loss was in the temporary brackets. Although it might be expected that the cost of the work handled under such conditions would be unusually high, this was not the case. The thoroughness with which the details of the plan were worked out made it possible to prosecute the work with very little interruption, to the construction forces and no delays to traffic, and the saving effected by using the old substructure and alinement much more than offset the additional cost of handling the erection in this manner.

The adoption of a 43 ft. truss spacing to place the new trusses outside the old made necessary the use of deep pier girders to carry these trusses on piers only 45 ft. long. To erect the new double track steel viaduct on the old alinement without interrupting traffic a special traveler was used which would allow a train to pass under it on one track. In closing the middle span, which was erected cantilever from both ends, the outer ends of the adjacent spans which were used as anchors during erection were jacked up enough to bring the top chord members together, a method which was first used on the Ohio river bridge at Louisville for a much longer span, and which proved simple and convenient both at Louisville and Kenova. These instances are typical of the advanced practice followed in the erection of this structure.

CANADIAN PACIFIC.

EACH succeeding balance sheet of the Canadian Pacific is a fascinating study. Possibly if we could have seen a balance sheet of the Standard Oil before the decree of dissolution it might have been comparable to this balance sheet of what is in many ways the greatest railroad corporation in the world. At the end of the fiscal year 1913 (June 30) the Canadian Pacific was operating 11,602 miles and earned from operation during that year a total of $139,396,000 and had outstanding but $13,158,000 mortgage bonds. In other words, here is a railroad com-



The Canadian Pacific.

pany with a bonded indebtedness of but a little over $1,000 a mile that earns over $11,000 a mile. The amounts due from agents and conductors and miscellaneous accounts receivable—$11,253,000—and the amount temporarily invested in government securities—$10,089,000—would have been more than sufficient to have paid the entire mortgage debt of the company, leaving $30,275,000 cash on hand, $12,073,000 advances and investments, exclusive of advances to lines under construction, and $44,499,000 deferred payments on land and town sites sales to meet current liabilities totaling $30,511,000. This information is given in the body of the balance sheet. The three-line note attached to the balance sheet, which is of itself rather fascinating, mentions that in addition to the assets shown the company owns 7,985,244 acres of land.

In 1912 the Canadian Pacific was unique among all the large railroad systems on this continent in being able to show as low an operating ratio as in the year before. In 1913 the operating ratio was 66.82 per cent., as compared with 64.89 per cent. in 1912; but during the past year the company has put in operation over 600 miles of new line. On a very considerable part of this new mileage revenues are not probably even paying operating expenses, while the inclusion of the figures for this new mileage tends to materially increase the ratio for total expenses to total revenues. President Shaughnessy mentions the cost of both maintenance and operation of this new mileage, but it is probable that it is chiefly in transportation expenses that the new mileage has disproportionately burdened the total. Total operating revenues in 1913 were $139,396,000 as against $123,320,000, while operating expenses were $93,150,000 in 1913, as against $80,021,000 in 1912. The transportation expenses were $46,074,000 in 1913 and $38,923,000 in 1912.

The Canadian Pacific has had some labor troubles during the year and the president's report mentions increases in certain rates of pay; but there are many indications in the annual report for 1913 that the materially larger transportation expenses are due in great part to the operation of the new and as yet unprofitable mileage. With an increase in ton miles carried of 10.43 per cent., there was an increase of but 7.36 per cent. in total freight car miles and an increase of 18.13 per cent. in empty car mileage. Despite the increase in empty car mileage, there was an increase of 2.45 per cent. in the average train load, the train load in 1913 being 381 tons.

An increase or decrease in empty car mileage is presumably due to changes in the character or direction of traffic. A quite notable increase in train load may be shown simply through a reduction of empty car mileage, the result of some new traffic without any more effective work on the part of the operating department. An increase, however, in revenue train load coincident with an increase in empty car mileage means either a reduction of grade, heavier power or a more effective use of the power in service.

The C. P. R. spent $30,818,000 for additional rolling stock, shops and machinery in 1913, and there were in operation 2,052 locomotives at the end of the year, as compared with 1,820 in operation at the beginning of the year. The company spent a total of $6,108,000 for double tracking, in the process of which undoubtedly there was some grade revision work. This addition of modern power, the grade revision work and an increase of 5.68 per cent. in the loading per loaded car, in part explains the increase from 372 tons to 381 tons in the revenue train load.

Besides the increases in transportation and maintenance expenses there was quite a marked increase in traffic expenses, these expenses amounting to $3,377,000 last year as against $2,881,000 the year before. The Canadian Pacific's traffic expenses are not high relative to its gross earnings, but are quite remarkably effective. It is the old story that advertising when backed up by real merit shows a high return on the investment. The principal efforts of the Canadian Pacific toward getting business are directed to the creation of new business. The C. P. R. owes a large part of its financial success to the substantial loyalty of the Canadian people to their greatest institution; but, on the other hand, mere figures cannot measure Canada's debt to the railroad.

There have been described in detail at various times in the *Railway Age Gazette* some of the methods by which the Canadian Pacific is developing the territory which it serves and inducing the immigration into its territory of settlers from Europe and England. The construction of 600 miles of road in a single year speaks eloquently of the fact that railroad building in Canada by the C. P. R. is still keeping ahead of the requirements of population. A glance at the accompanying map will show what an extensive program of new construction the Canadian Pacific now has under way. In 1913 the total amount spent for new construction and for additions and improvements, exclusive of expenditures for new shops and new equipment, amounted to $45,922,726.

The character of freight traffic carried is a striking justification, if any justification is necessary, of the expenditures that are being made by the Canadian Pacific to develop the Canadian agricultural and lumber industries, and to induce settlers to immigrate into Canada. The total number of tons carried in 1913 amounted to 29,472,000 tons. This presumably is long tons, and the Canadian Pacific classifies its traffic according to the English system showing barrels of flour, bushels of grain, etc., so that only an approximately correct division can be made on a tonnage basis. Approximately the grain furnished 16 per cent. of the total tonnage, flour about 2 per cent., livestock about 3 per cent., lumber about 16 per cent., and manufactured articles about 32 per cent. All other articles only furnish about 32 per cent. Coal, therefore, must make up only a small portion of the Canadian Pacific's total tonnage; and it is interesting to note how important is the tonnage of manufactured articles. Of course, the Canadian Pacific competes on manufactured articles westbound with American transcontinental roads, and not all of the 9,519,000 tons of these articles carried in 1913 went to Canadian settlers.

The following table shows the ratio of maintenance and transportation expenses to total operating‡ revenues:

Maintenance of way	13 per cent.
Maintenance of equipment	12 per cent.
Transportation expenses	33 per cent.
Traffic expenses	2 per cent.

The following table shows the principal figures for operation in the fiscal year ended June 30, 1913, compared with that in the previous fiscal year:

	1913.	1912.
Mileage operated	11,602	10,983
Freight revenue	$89,655,223	$79,833,734
Passenger revenue	35,545,062	31,812,208
Mail	921,683	859,558
Sleeping car, express, telegraph and miscellaneous	13,273,732	10,814,042
Total operating revenues	139,395,700	123,319,541
Maintenance of way and structures	18,498,741	17,719,795
Maintenance of equipment	17,198,573	13,608,708
Traffic	3,376,981	2,880,800
Transportation expenses	46,074,299	38,923,050
Parlor and sleeping car expenses	1,241,700	944,594
Expenses of lake and river steamers	1,113,808	1,064,011
Commercial telegraph	1,691,953	1,435,944
General expenses	3,953,770	3,444,395
Total operating expenses	93,149,826	80,021,298
*Operating income	46,245,874	43,298,242
Net earnings of steamships in excess of amount included in operating revenues	1,245,563	1,104,449
Net corporate income	36,615,085	33,877,754
Replacement fund and pension fund	1,125,000	1,125,000
Dividends	17,189,827	15,192,235
†Surplus	18,310,258	17,560,519

*Taxes are included in operating expenses.

†No account is taken of the profits from land sales, from which profits 3 per cent. additional dividends are paid on the ordinary stock, making 10 per cent. paid in all.

‡These ratios are not accurately comparable with roads reporting to the Interstate Commerce Commission, since operating revenues includes revenue from sleeping cars, restaurants, some steamship revenues, etc.

NEW BOOKS.

The Lure of the Iron Trail. By Ward W. Adair. New York: Association Press, 124 East 28th street. Cloth, 201 pages, 5 in. x 7¾ in. Price $1.

This book is wholly religious, yet filled with everyday life, and true to nature. It consists of thirteen stories of railroad men who had wasted their substance in riotous living, but who turned to God and reformed, thereafter living lives of usefulness and honor. Mr. Adair is a skilful and entertaining writer. He is the secretary of the Young Men's Christian Association at the Grand Central Terminal, New York City and a popular friend of the men who use the rooms of that association. Some of his stories are a trifle strong in color for the conservative reader, and now and then his knowledge of railroad practice is slightly awry; but as a whole the book is exceedingly well written, and the imaginary conversations of trainmen, shopmen, clerks and all classes have the marks of reality. Indeed, for the general reader, Mr. Adair's work gives pictures of railroad life of a quality rarely found; true in detail, sane in spirit and always of high moral and ethical tone. The subjects of the sketches are real men and some of the narratives give real names—Tom Keenan, for example, the Lackawanna engineman who has preached all over the country; also Charlie Haight, who received the Congressional medal for saving the life of a little child. The book contains some good illustrations, including a facsimile of President Roosevelt's letter to Haight.

Electric Interlocking Handbook. Henry M. Sperry, Editor, Rochester, N. Y.: General Railway Signal Company. Leather, 435 pages, 4¼ in. x 7 in. Price $3.

This book is an advertisement of the machines and apparatus made by the publishers; but it contains such a large amount of what may be called staple information, such as one finds in standard engineering pocket books, that it deserves to be included in that class. The engineers of this company, who have prepared the work, not only have high reputations in their profession, but are known also as hard workers, and this book gives new evidence of that fact.

The scope of the work may be gathered from the chapter headings: G. R. S. Electric Interlocking System; G. R. S. Interlocking Appliances; G. R. S. Alternating Current Appliances; Signal Lighting and Interlocking Plants; Electric Locking and Check Locking; Installation and Operating Data (seven chapters devoted successively to power plants and switch boards, electric interlocking machines, switch mechanisms, signal mechanisms, relays and indicators, transformers and primary batteries); Wire Trunking and Conduit; Concrete; Written Circuits; Aspects and Symbols; Data.

Each chapter may be termed a condensed treatise. Standards of the Railway Signal Association innumerable are quoted, amplified and explained. Circuit diagrams are made plain, where necessary or desirable, by the use of two colors, red and black. The foreman of construction or the maintainer finds at every step not only concise instruction what to do, but lucid explanations of reasons, which aid him to master the subject. There is a good variety of data in tables, such as is found in mechanical engineers' handbooks. The instructions for oiling an automatic signal mechanism are given in the shape of a skeleton drawing, with red lines leading to every oil cup and every surface needing lubrication. The chapter on "written circuits" consists of a concise code of instructions, with suitable symbols, for use on the ground in installing extensive interlocking plants.

The introduction to the book is a brief historical sketch by W. W. Salmon, president of the company. He predicts that within the next ten years many important railways will have all or nearly all of their block signals and their interlocking machines on their main lines operated by electricity. Multiplying the number of levers of this company's interlocking machines now in service by the number of years that they have been in service, the product is 110,000, a number which is termed 110,000 "lever years."

Letters to the Editor.

FUEL ECONOMY.

Baltimore, Md., August 13, 1913.

To the Editor of the Railway Age Gazette:

I have read with a great deal of interest and appreciation D. C. Buell's article on this subject in the *Railway Age Gazette* of August 8, and I believe that if his suggestions were put into practice they would be the means of saving a great deal of coal for the railroads.

However, I have a few suggestions to offer. First, enginemen and firemen, who are the ones who handle the bulk of the coal and consequently can save or waste more than any other employees, must be interested in their work and give at all times their hearty co-operation. To obtain this may prove very difficult to some railroad men, but in reality it is not. There is only one requisite, that harmony and good feeling exist between the officers and employees. This spirit can be created in various ways, but to my mind the most practicable method is for the officers to show their appreciation of good work. Any man in the rank and file realizes that he must work for a living, but when he sees that his work is fully appreciated he will always strive to do his best. I also think we should have more frequent talks on fuel economy and other important subjects from the higher officers; lectures three or four times a year would be advisable. Second, the enginemen and firemen should be properly instructed at every opportunity so that they may become as efficient in their work as possible. The firemen should be shown that by intelligent firing, resulting in saving coal, they save themselves much useless labor. The enginemen also should be shown how to work a locomotive in the most economical way and thereby save the firemen a great deal of labor. Here again it is necessary that friendship and co-operation exist, and therefore great care should be given to the assignment of engine crews. Third, it should be demonstrated by frequent tests with different locomotives and trains, both freight and passenger, just what amount of coal is necessary for a trip, and there should be placed on the tender of each locomotive a limited amount for each trip, with a few additional tons to take care of extra cars, unusual delays, bad weather conditions, etc. It is the practice of every railroad to have a schedule of oil allowance, and I see no reason why a similar schedule cannot be used successfully with regard to the fuel. There is no need of weighing the coal; all that is necessary is to have marks on the sides of the tank from one-half ton up and then fill up to the mark which designates the amount necessary to supply the locomotive over the division or to the next coal tipple. If an engine crew has a certain amount of coal with which to make a trip, they will naturally be economical from the start. Of course if the limited allowance is not sufficient for some crews, the engineman could make out a coal check and get the extra amount he desires at one of the coaling stations, for by no means should there be a loss of time on any train; then after the trip is completed the engine crew should explain why they used more coal than the regular allowance, and from their statements and the trip itself it can very readily be determined where the fault lies. It does not follow that the crew should be disciplined, but their attention should be called to the matter, for their inability to produce the required results signifies that they are either careless and in need of further instruction, or else they are not properly mated, and to insure success the engineman must co-operate with the fireman.

Road Foreman.

Coal Supplies for the Belgian Railways.—At present almost all the coal needed by the Belgian state railways is, by law, supplied by Belgian collieries. The railway administration contemplates the revival of the system of inviting public tenders, which, if adopted, would probably result in considerable quantities of coal being obtained from Great Britain, as was the case until about two years ago.

"GETTING MORE MOVEMENT FOR FREIGHT CARS."

Experienced Transportation Men Discuss Arthur Hale's Recent Article, and Suggest Methods for Increasing Efficiency.

A PROBLEM FOR ALL OPERATING OFFICERS.

By E. H. De Groot, Jr.,

Superintendent of Transportation, Chicago & Eastern Illinois.

The fact that confronts the transportation officer is that any remedy for delays to cars while in the possession of the railways for movement lies within his own hands. No man can afford to deceive himself and Arthur Hale in his article on "Getting More Movement for Freight Cars" in the *Railway Age Gazette* of August 1 has clearly pointed out the lines along which investigation should be directed in the endeavor to expedite the movement of freight equipment. "Getting more movement for freight cars" is only one phase of the car efficiency problem, but it is a big one and can only be solved by securing definite information as to conditions and acting upon such information.

Any attempt to increase the activity of the equipment without active co-operation by the superintendent will be futile. This was probably Mr. Hale's idea when he called attention to the fact that the best way to reduce the number of cars left in yards "Is to bring the facts home to everyone concerned, i. e., to everyone who can help."

The superintendent is the key to this situation. If he does not take a personal interest in the subject, the rest of the division organization will never be more than luke-warm. If he is active, his activity will be multiplied to the extent of the entire organization, notwithstanding that in this day of specialization, there is a tendency to confine the interest of the individual officer or employee within well defined limits.

As a matter of fact, there is no reason why the division engineer, master mechanic, road foremen and every other man on the division pay roll should not be actively interested in car movement. A superintendent told me not very long ago that a stenographer, new to him, but acquainted with the road, suggested that he (the superintendent) had made a mistake in instructing that certain data regarding car mileage be sent to the division engineer in addition to other members of his staff. The reply was that the division engineer is as much a member of the car department as the car distributor. This is the spirit which will go far in bringing about the necessary results.

With the superintendent so interested that he will enthuse agents and yard masters, as well as train masters and other officers, in the development of actual conditions for which they are personally responsible, much better results will be secured than where a man from the general office brings these conditions to light, and so places the division and local men on the defensive.

Mr. Hale has well said that increasing the speed of freight trains as a means of getting more movement for freight cars is not a factor. Anyone who has not analyzed freight car movement will be surprised to find how fast the cars travel when once they are placed between a road engine and caboose.

Conditions at each interchange point, yard and station should be carefully analyzed. Sometimes false switch engine economy delays cars on connections as well as in yards and on team, industry and repair tracks. It is not hard to find the line beyond which it is false economy to reduce the number of switch engines worked, and this line should be carefully established.

Delays for inspection, the set-back evil, delays for billing from delivering line, etc., all suggest their own remedies. The work of yard clerks, bill clerks and car inspectors has an important bearing upon the expeditious handling of cars in yards. These delays multiply, of course, with the number of yards through which a car must pass in making a given trip, and Mr. Hale states the case in a nut-shell when he says, "The problem for the transportation departments of the country then, during the next car shortage, is to reduce the delays to cars in yards."

I take it that he makes this statement in its broad sense, and intends it to cover the local stations also. An analysis of delays at these stations emphasizes the dependence of such points upon local freight trains for both switch and road movements, trains which do not run on Sundays and legal holidays.

Agents can keep down delays to foreign cars by regularly reporting them for disposition as soon as received under load, and car distributors should give disposition to agents in time for incorporation into switch list for the first local train in the direction involved. Local freight crews should make delivery of cars in their trains to intermediate connections even though they may have met the opposing local train which is required to do work at that station.

These points are merely suggestive. Investigation, analysis and the application of the remedies suggested by the conditions found will increase car activity. The work will never be finished, but substantial progress will result from eternal vigilance.

METHODS USED TO INCREASE CAR EFFICIENCY ON SUNSET-CENTRAL LINES.

By F. M. Lucore,

Assistant General Manager, Sunset-Central Lines.

Much can be accomplished by railway men in car handling by discussing ways and means for reducing railroad detention and forgetting for the moment to discuss ways and means of reducing so-called shippers' and consignees' detention. Some of the methods in effect on the Sunset Central Lines to bring about good car handling are as follows:

(1) We secure written orders from shippers on form provided, setting forth the number of empty cars required.

(2) We place empty cars on definite orders, and keep the remainder in stock. In other words, we are breaking away from the practice of placing empties before they are ordered by the shipper.

(3) We take empty cars from stations which have no unfilled written orders, and move them to stations which do have such orders.

(4) We freely accept cars in interchange from connecting lines. If the cars are tendered to us in bad order we repair them. In addition, we advise the delivering line, giving details. This has had the effect of causing the inspection of cars to be materially tightened up before they are tendered to us. Less than 3 cars in 100 which we receive from connections have to be repaired.

(5) We urge connecting lines to let us know of each car which we tender to them that is either in bad order condition or without proper data for forwarding in order that we may, in turn, prevent a recurrence.

(6) We aim to have loaded cars moved through terminals in the order of their arrival.

(7) We examine the records to ascertain how promptly, on arrival at destination, cars are placed where they can be unloaded. This is no small task, but it pays.

(8) We cease supplying empty cars with which to handle

shipments destined to consignees who are already overstocked with loads which they are unable to release.

(9) We commend yard clerks, yard masters, freight conductors, local agents, chief despatchers and others for good work performed in car handling.

(10) We have sufficient traveling agents to cover each operating division, and two inspectors of transportation to supplement the work done from the division and general offices.

(11) In conclusion, everybody on the Sunset-Central lines, from the president down, is a car man.

It is to be hoped that Arthur Hale's splendid article, entitled "Getting More Movement for Freight Cars," appearing in the issue of the *Railway Age Gazette* for August 1, will stimulate all of us to study more diligently into the car handling problem to the end that such efficiency as is possible within ourselves may be secured. Then it is believed that such help as may be needed from the public can also be secured.

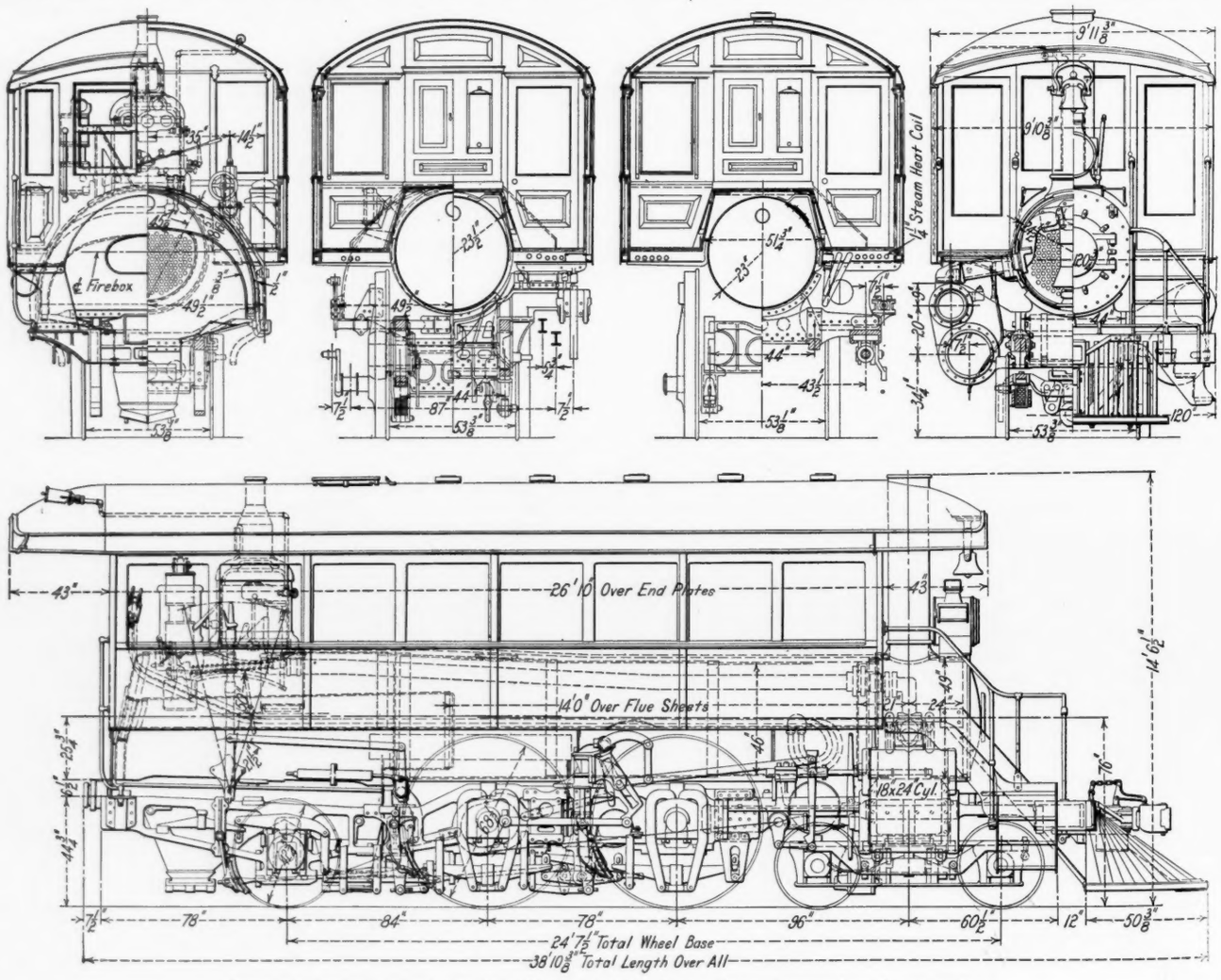
ATLANTIC TYPE INSPECTION LOCOMOTIVE.

The Philadelphia & Reading has recently designed and built at the Reading shops three Atlantic type locomotives for inspection purposes. The Atlantic type was selected in order to obtain the large grate area desired. The boiler shell is very small in diameter so that it fits between the wheels and is so located that the center of the boiler barrel is only slightly above the top of the drivers. A small wash room is provided in the cab and the fittings throughout are heavily nickel plated, giving the locomotive a very attractive appearance. No provision is made for operating the locomotive from the observation room, but push buttons are provided for attracting the attention of the engineer, and there is an emergency brake valve in each front corner of the observation room. While the locomotive normally is operated alone, it has sufficient tractive effort to haul one or two private cars on a good schedule.

The firebox is of the Wooten type and the crown sheet is on a level with the top of the firedoor. The size of the grate is large, there being an area of 63 sq. ft. provided. The usual combustion chamber is arranged ahead of the firebox and the brick wall is used in the normal position. This leaves space for 14 ft. tubes, of which there are 180, 1¾ in. in diameter, giving 1,154 sq. ft. of heating surface. The dome is so located as to be included in the engineer's cab and it could be made as large as desired. It is 27½ in. in diameter or considerably more than half as large as the barrel of the boiler and measured 34 in. in total height. This will insure dry steam, although it is located directly above the hottest part of the crown sheet. No superheater has been applied. It will be noted in this connection that the crown sheet is very largely supported by sling stays, there being but seven rows of radial stays at the back. Flexible staybolts have been put in the breakage zone on both side sheets. A steam pressure of 225 lbs. is carried.

Underhung spring rigging was necessitated by the relative positions of the frames and boiler shell. This is arranged to be continuous on each side for the drivers and trailing wheels, there being four semi-elliptical springs in each set.

The cylinders are 18 in. by 24 in. and are separate from the saddle casting and the single bar front rail of the frame is en-



General Arrangement of the Philadelphia & Reading Inspection Locomotive.

closed between the two; 11 in. valve chambers are set 7½ in. outside of the cylinder centers and the outside steam pipe extends from the side of the smoke box, underneath the floor of the observation room, to the top of the steam chest in nearly a horizontal line.

The valve gear is of the Walschaert type with the link supported by a casting extending between the two drivers. Owing to the location of the boiler, it is not possible to carry the lift shaft across the locomotive in a straight line. Furthermore, there is no clearance for an upwardly extending arm on this shaft for connecting with the reverse lever. An arrangement has therefore been made whereby the reach rod from the reverse lever connects to the arm on a shaft bolted on the frame just ahead of the firebox. This shaft extends inward to the center of the locomotive, where it has a downwardly extending arm to which a bifurcated reach rod is connected that connects to the downwardly extending arm at the center of the lift shafts for each side of the locomotive. This rod spans the axle of the rear driver.

Interior of Observation Room Looking Towards the Rear.

One of the most interesting features of the whole design is the combination lever and screw reverse gear that has been provided. The arrangement is such that the engine can be reversed by a lever in the ordinary manner, or if desired it can be adjusted by a screw gear. This combination has been accomplished by having the nut which meshes with the screw cover but the upper half of its circumference. It is set in guides formed by the sides of the reverse lever which span the screw and is connected to the latch by links so that it can be lifted, the screw acting as a quadrant when the lever is being moved by hand. When it is latched, however, the turning of the screw will move the lever to any desired point. As the lever swings from a stationary fulcrum and the screw block in the lever cannot move in a vertical direction, it was necessary to arrange the screw itself to take different angles, depending on the position of the lever. This has been done by carrying the whole screw operating gear on a pinion supported by a casting on the boiler head. At the front end the screw has only a guide to keep it in line. The hand wheel is connected to the screw itself by a train of gears which not only increases the leverage of the wheel, but also brings it in a more convenient location for handling.

Provision for heating the observation room is made by means of steam pipes under the floor. A small turbo generator is provided for supplying current for the electric lights. One of the illustrations shows the interior of the observation car, giving a good idea of the clearness of vision which can be obtained on all sides.

General dimensions, weights and ratios of this locomotive are given in the following table:

General Data.

Gage	4 ft. 8½ in.
Service	Inspection
Fuel	Anthracite
Tractive power	21,700 lbs.
Weight in working order	161,500 lbs.
Weight on drivers	98,375 lbs.
Weight on leading truck	26,775 lbs.
Weight on trailing truck	36,350 lbs.
Weight of engine and tender in working order	299,500 lbs.
Wheel base, driving	6 ft. 6 in.
Wheel base, total	24 ft. 7½ in.
Wheel base, engine and tender	53 ft. 5½ in.

Ratios.

Weight on drivers ÷ tractive effort	5.13
Total weight ÷ tractive effort	8.41
Tractive effort × diam. drivers ÷ heating surface	1,032.0
Evap. heating surface ÷ grate area	20.22
Firebox heating surface ÷ total evap. heating surface, per cent	10.61
Weight on drivers ÷ total heating surface	77.20
Total weight ÷ total heating surface	126.7
Volume, both cylinders, cu. ft.	7.06
Total heating surface ÷ vol. cylinders	180
Grate area ÷ vol. cylinders	8.92

Cylinders.

Kind	Simple
Diameter and stroke	18 in. x 24 in.

Valves

Kind	Piston
Diameter	11 in.
Greatest travel	7 in.

Wheels.

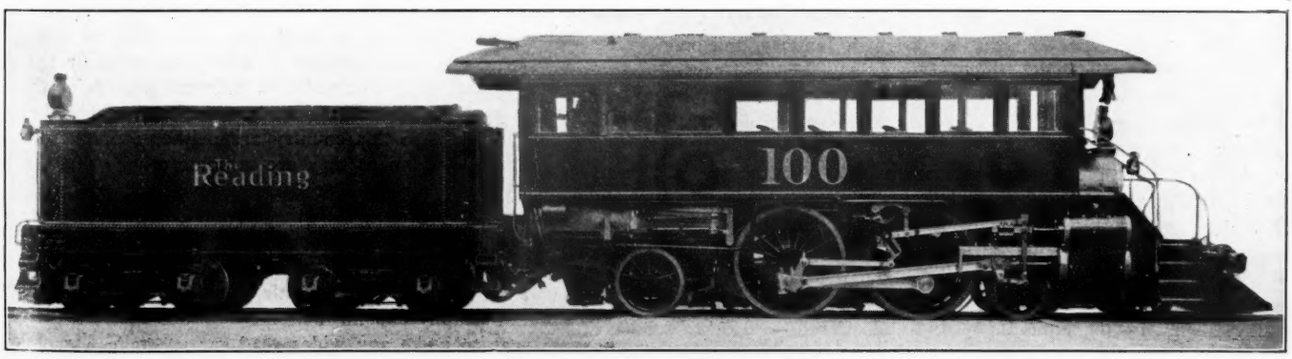
Driving, diameter over tires	68½ in.
Driving journals, main, diameter and length	8½ in. x 12 in.
Engine truck wheels, diameter	33 in.
Engine truck, journals	5½ in. x 10 in.
Trailing truck wheels, diameter	42¾ in.
Trailing truck, journals	7 in. x 12 in.

Boiler.

Style	Wooten
Working pressure	225 lbs.
Outside diameter of first ring	46 in.
Firebox, length and width	108 in. x 84 in.
Tubes, number and outside diameter	180—1¾ in.
Tubes, length	14 ft.
Heating surface, tubes	1,154 sq. ft.
Heating surface, firebox	120 sq. ft.
Heating surface, total	1,274 sq. ft.
Grate area	63 sq. ft.
Smokestack, height above rail	14 ft. 6½ in.
Center of boiler above rail	76 in.

Tender.

Frame	12 in. channel
Wheels, diameter	36 in.
Water capacity	6,000 gals.
Coal capacity	9.75 tons.



Atlantic Type Inspection Locomotive Designed and Built by the Philadelphia & Reading.

E. P. RIPLEY ON CAR SHORTAGES.

E. P. Ripley has sent the following letter to the Chicago *Examiner* in reply to an editorial on car shortages, published in that paper:

"Your editorial indicates that car shortages occur in this country every year, that the public cannot understand why this is the case, and that an explanation of the matter is due from railway officers. Since you have raised the question of the reason for car shortages, I have no doubt that, in a spirit of fairness, you will give me space in which to answer.

In the first place, you are in error in implying that car shortages occur annually. There were net shortages in 1907, 1909 and 1912, but there were none in 1908, 1910 or 1911, so that in one-half of the last six years there have been no net shortages.

"Secondly, car surpluses are much more common in the United States than car shortages, and become much larger. There are always shortages in some parts of the country and surpluses in other parts of the country because it is impossible to move cars so as always to have them just where they will be needed next. If the total shortage exceeds the total surplus there is a net shortage, and if the total surplus exceeds the total shortage there is a net surplus. The American Railway Association between January 2, 1907, and July 15, 1913, made 162 fortnightly reports regarding car shortages and car surpluses, and 139 of those reports showed net surpluses of cars while only 23 showed net shortages. In other words, there have been surpluses of freight cars six-sevenths of the time during the last six and one-half years. Furthermore, the net surpluses reported greatly exceeded the net shortages. The largest net shortage reported in 1907 was 137,847 cars, while on April 19, 1908, there was a net surplus of 413,000 cars. The largest net shortage in 1909 was only 5,740 cars, while the largest net surplus in that year was over 330,000 cars. The largest net shortage in 1912 was 51,112 cars, while the largest net surplus was almost 136,000 cars.

"Since the railways during the last six and one-half years have supplied more cars than there was a demand for six-sevenths of the time, the question naturally arises as to why they have not been able to furnish enough cars the other one-seventh of the time. The answer is to be found in the figures showing the violent fluctuations in the amount of freight traffic that is offered to them to handle at different parts of the year. The statistics for 1912 are fairly typical of those of a year of car shortage. In January of that year the earnings of the large railways from freight traffic as reported by the Interstate Commerce Commission were less than $141,000,000, and on January 17 there was a net surplus of over 90,000 cars. In October of the same year the freight earnings of the same roads were almost $211,000,000, or about 50 per cent. greater than they were in January, and on October 24 there was a net shortage of about 50,000 freight cars. The average earnings per month for the year were $169,500,000 and the average net car surplus, or average safety margin, was 33,335 cars; the maximum volume of business was thus 24 per cent. greater than the average volume. Is there anything very mysterious about the inability of any concern to deal satisfactorily with its maximum business when its maximum monthly business exceeds its minimum monthly business by 50 per cent.? Obviously, if it provides enough facilities to handle its maximum business promptly and satisfactorily it will have a large surplus capacity when only its minimum business is offered.

"Perhaps it may be contended that the railways should provide so much equipment that they could promptly supply a car to every man who ordered it even in the season of the heaviest movement of traffic. But if they did this they would have to make a large additional investment. They would have to earn a return on this investment, and those to whom the cars were supplied would have to pay rates sufficient to yield a return on the additional investment. That the present rates are not sufficient to earn a return on an enormous additional investment is shown by the fact that the average rate of dividend paid on all railway stock outstanding in the year ended June 30, 1912, was only 4.7 per cent., while the average rate of interest paid is slightly less than 4 per cent. The question for the people of the country to consider is whether they are willing to pay what must necessarily be spent in order to provide cars enough promptly to move the maximum business that is offered. Thus far they have not shown a disposition to pay enough to enable the railways to supply the additional equipment that would be required to do this.

"But over and beyond the question of increased cars is the question of increased number of locomotives to move them, increased terminals and trackage for them to stand on, and above all increased forces of men to run the engines and handle the trains. It is manifestly impossible to vary the forces of men 50 per cent. each year with the fluctuations of traffic, and this problem, difficult as it is under ordinary conditions, has been rendered far more difficult by the absolutely useless full crew legislation which has been passed in many of our states.

"The car shortages in this country are usually discussed as if similar conditions were uncommon in other countries. This is not the fact. There repeatedly have been severe car shortages in recent years on the German railways, which are owned by the government. There was one in 1912 which began in August and lasted until the end of the year, and the situation finally became so acute that the state railway administration stopped all traffic on the west bank of the Rhine for four days. The German shippers have complained bitterly about these car shortages, but a high officer of the Prussian State Railways was quoted in a cable despatch from Berlin on December 7, 1912, as saying that "the state cannot invest undue amounts of capital where it will have to lie unemployed for the greater part of the year." Likewise, in recent years there have been severe car shortages on the railways of Australia, which also are owned by the governments. Regarding the situation in New South Wales the Sydney *Sun* said in its issue of February 12, 1912: 'As each harvest comes round the position is more intensified. The trade is actually paralyzed and the future is viewed with dismay.' The chief sufferers from the car shortages in Australia have been the shippers of agricultural products. There was a severe shortage of cars in Canada in the fall of 1912, and a recent elaborate report of the British Board of Trade on the operation of the railways of the various European countries shows that there are also complaints of shortages of cars in France, especially on the government railways; in Italy on the government railways; and in Austria-Hungary on both private and state railways, but especially on the latter.

"In other words, car shortage is almost a world-wide condition, and complaints of it are especially rife in countries where industry and commerce are expanding and railway traffic is increasing rapidly. Doubtless in most other countries, as in the United States, car shortages are due chiefly to the wide fluctuations in the amount of freight traffic at different periods of the year, and the evidence indicates that, however regrettable they may be, the shortages in this country are neither as numerous nor as large in proportion as they are in some other countries, as Germany, for example.

"If our law-makers would stop the stream of expensive and useless legislation which is being poured out in such floods upon the railroads and see what the effect is of regulation by the commissions and the courts, there is little doubt in my mind that railroads would steadily expand their facilities and increase their equipment so as to make any widespread car shortage less and less a likely possibility. A great part of the trouble in the past and the possibility of danger in the future lie not in failure of railroads to foresee and anticipate the needs of the country, but in the inability to raise money to provide facilities on account of the destruction of railway credit by hostile legislation."

Collapse of Italian Railway Bridge.—A railway bridge in course of construction near Genoa, Italy, collapsed on August 19, with the result that two men were killed and ten other persons were injured.

NEW OHIO RIVER BRIDGE AT KENOVA, W. VA.

Replacing of Five Span, Double Track, Through Truss Structure on Same Piers Without Interrupting Traffic.

The old bridge which carried the Virginia and Ohio line of the Norfolk & Western over the Ohio river at Kenova, W. Va., and which has just been replaced, was built in 1891-2. It was 3,942 ft. long and consisted of five river spans, one 518 ft. long and four 298 ft. long, and a 2,210 ft. steel trestle approach on the east end. A minimum clearance of 40 ft. above extreme high water was required for navigation, making the four river piers nearly 100 ft. high. These piers were built of sandstone and local freestone. The bridge was built for a single track, but the trusses were spaced 34 ft. center to center, with the intention of adding a second track in the future by placing a third truss between the two original ones. This was never done, although when the line was double tracked east of Kenova, two gauntleted tracks were laid on the structure. As there are 60 to 70 train movements a day over this portion of the line, it was very important that the capacity of the bridge be increased by adding a second track, and it was necessary to accomplish this without interrupting traffic.

Fig. 1—The Old Norfolk & Western Bridge at Kenova.

THE OLD BRIDGE.

The old bridge was designed for Cooper's E-40 loading, the steel being heavy enough to carry two tracks if the third truss had been placed according to the original design. For present loadings, however, and the prospective increase in such loadings which must be taken into account in bridges built today, some strengthening of the bridge would have been necessary in any permanent improvement, and it was decided that it would be more advisable to build an entirely new double track structure. No change in location was feasible, as the present alinement approaching the bridge on the east is very good and any change would have involved the purchase of improved property in the city of Kenova at a high price. It would have been practically impossible to have made any line change which would not have introduced considerably more curvature, and thereby injured the operating qualities of the line. In addition to these considerations, the old piers were still in excellent condition and a considerable saving in the cost of the structure was made possible by their use.

In order to build the new bridge on the old alinement without interruption to traffic it was necessary to erect the new trusses outside of the old, and although the old bridge was of unusual width on account of the provision for the middle truss, the new bridge had to be made still wider. The piers which had a minimum length of 45 ft. over copings, sufficient for an ordinary double track bridge, were not long enough to carry the end bearings of the new trusses in the usual manner. On account of the fact that the river at this point is deep, the current swift and the piers high, it was not thought advisable to incur the expense of lengthening them, so special pier girders were designed to carry the bearings of the new trusses on cantilever arms. These girders are necessarily very deep, and as there was to be practically no change in grade on the bridge, it was necessary to cut off the tops of the old piers to provide clearance for the girders below the bottoms of the trusses. These changes involved some rather unusual substructure work and a number of interesting problems were encountered in the erection of the superstructure.

DESIGN OF NEW SUPERSTRUCTURE.

The new bridge has the same span lengths as the old, 518 ft. and 298 ft., respectively, the trusses being spaced 43 ft. center to center. Two assumed loadings were used in the design of the superstructure. The first assumed in the design of the trusses a uniform load of 8,500 lbs. per lineal feet per track, with the addition of two concentrations of 70,000 lbs. each, spaced about 30 ft. center to center; for the floor beams and hangers 8,500 lbs. per ft., with eight 85,000-lb. axles; and for the

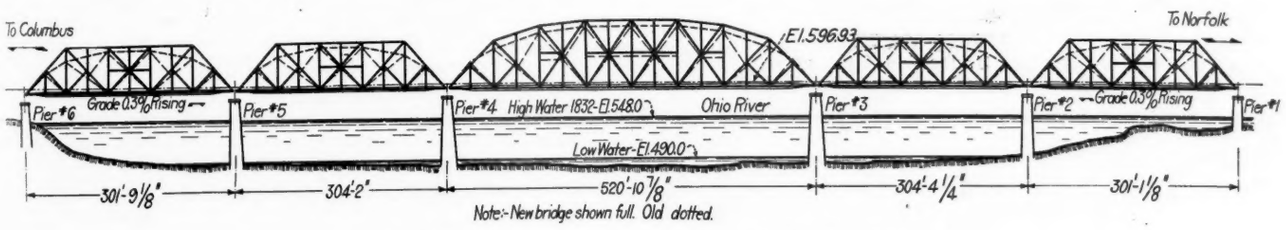


Fig. 2—General Elevation of New and Old Bridges.

stringers 8,500 lbs. per ft., with five 85,000-lb. axles. The impact in all parts of the structure for this assumed loading was added in accordance with the formula $I = \frac{300}{L + 300}$. The tensile strength in steel was assumed as 62,000 to 70,000 lbs. per sq. in., and in rivet steel 47,000 to 55,000 lbs. per sq. in. The permissible fiber stresses were as follows:

Tension, 20,000 lbs. per sq. in. (including dead, live and impact stresses).

Tension, 24,000 lbs. per sq. in. (including dead, live, impact, wind and secondary stresses).

Compression, 20,000 lbs.—$100 \frac{L}{R}$.

Extreme fiber stress on pins, 30,000 lbs. per sq. in.
Shear on shop rivets and pins, 15,000 lbs. per sq. in.
Shear on air driven field rivets, 14,000 lbs. per sq. in.
Shear on hand driven field rivets, 12,000 lbs. per sq. in.
Shear on plate girder webs, 12,000 lbs. per sq. in.
Bearing on shop rivets and pins, 30,000 lbs. per sq. in.
Bearing on air driven field rivets, 28,000 lbs. per sq. in.
Bearing on hand driven field rivets, 24,000 lbs. per sq. in.
Bearing on masonry, 600 lbs. per sq. in.

The design as computed from the above assumptions was compared with the results secured from Cooper's E-60 loading, combined with the allowable unit stresses given in the specifications

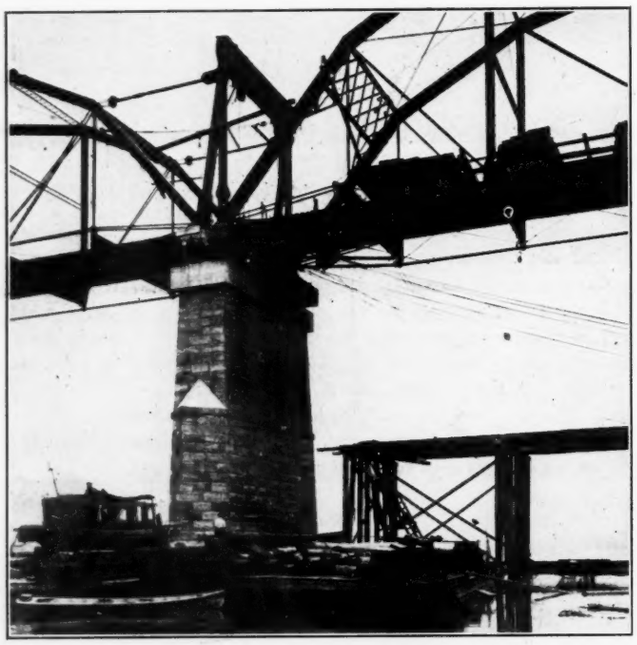


Fig. 3—Placing a Pier Girder Under Old Span after Cutting Away Half of the Top of Old Pier. The Right Hand Span Is Supported Temporarily by the Gallows Frame.

of the American Railway Engineering Association of 1910 and for a given member the maximum stress found by these methods was used in the design.

The new bridge is laid with 100-lb. rails on the westbound track and 85-lb. rails on the eastbound, white oak ties being used throughout. A special form of rail anchor is used on the viaduct approach which consists of two bent plates, one bolted to the top flange of the track girder and the other to the web of the rail, the two being joined by an insulated connection. This anchor has proved very efficient in preventing rail movement on this approach viaduct. The new bridge was painted with one shop coat of red lead and two field coats of carbon black. The work of cutting down the old piers was begun in April, 1912, and the erection of the new steel was begun in June.

ALTERATIONS TO OLD PIERS.

The old stone piers had to be cut down about 8 ft. to allow the placing of the new pier girders, but as there was a difference in the elevation of the old piers of about 1 ft. 7 in., and the courses of stone varied in thickness from 16 in. to 22 in., this total cut was somewhat irregular. On five of the piers five courses of stone were removed, and on the sixth pier four courses were taken off. The total cut varied from 6 ft. 9 in. to 8 ft. 3 in., the average being 7 ft. 10 in. The girders on piers 3 and 4 supporting the central span are 5 ft. deep. The other

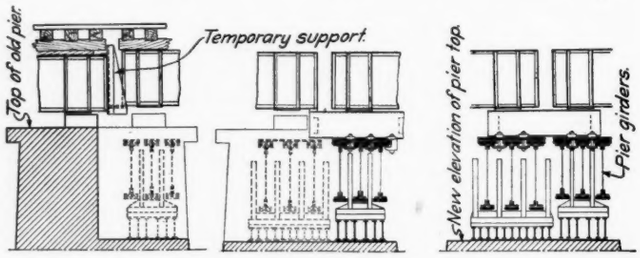


Fig. 4—Sequence of Operation in Cutting Down Piers Without Interference to Traffic.

girders supporting the 298 ft. spans are 4 ft. 3 in. deep. The tops of all of these girders were located a uniform distance below the base of rail and on account of the variation in the elevation of the piers and the difference in depth of girders, a number of combinations of plates and I-beams had to be used under the cast steel pedestals supporting these girders. The distance from the bottom of pedestals to the top of masonry varied from 3 ft. 7/8 in., to 2 ft. 1/8 in. For depths less than 1 ft. a combination of plates was used under the pedestals and for depths more than 1 ft. 10 in., 12 in. or 20 in. I-beams were used with plates as required.

The removal of the tops of the old piers made it necessary to reinforce the new tops in some manner to take the place of the coping which was removed. A new concrete coping was built around the piers at the elevation of the new top before the top courses were removed, this coping extending down three courses below the shoes of the pier girders. The old piers 1, 2, 5 and 6 were 12 ft. wide and 45 ft. long over the coping, and piers 3 and 4 were 14 ft. wide and 48 ft. long. The new concrete coping for the smaller piers is 13 ft. 6 in. x 46 ft. 6 in., and for the larger piers 15 ft. 6 in. x 49 ft. 9 in., a minimum thickness of 16 in. of concrete being allowed over the stone on the sides of all of the piers, and 18 in. on the ends. A 1:2:3 concrete mixture was used in these copings.

Three sets of reinforcement were provided in these belts. The first consists of six 2 in. bolts through each pier, set in holes drilled through the first and third stone courses below the new top of masonry. These are arranged in three pairs, each pair being connected by a 1 in. plate 6 in. wide. Each bolt is threaded 18 in. on each end and allowed to project into the concrete. Three hexagonal nuts are used on each end, one holding a 6 in. x 6 in. x ½ in. plate tight against the stone, and the other two holding the plate connecting each pair near the end of the bolts. Just outside of the ends of these bolts is the second set of reinforcement, which consists of ¾ in. square bars set vertically on 12 in. centers. These bars are bent in at the bottom to form the surface reinforcement for the lower portion of the belt. The third set of reinforcement, which consists of 1 in. square bars on 6 in. centers placed horizontally entirely around the piers, is located just outside of the vertical bars. The lower portion of these concrete courses was placed up to the new top of masonry before the piers were cut, as shown by the dotted lines in the accompanying drawing. After the erec-

tion of the steel, the concrete was carried over the top of the stone masonry and filled in around the shoes and pier girders as shown in the cross sections herewith. The vertical reinforcement in the lower portion of the belt was allowed to extend above the concrete placed in the first operation and the bars forming the surface reinforcement for the upper portion were lapped over these. Horizontal reinforcement was provided in the top portion of the coping similar to that described above. The concrete over the pier girders is bonded to that between the webs by short sections of 1 in. bars set vertically, and it is surface reinforced by ½ in. bars in both directions. The girders which are on the two long piers, 34 ft. 9 in., and for the smaller girders 32 ft. 9 in. As the new trusses are 43 ft. center to center, the amount of cantilever at each end of the heavy girders is 4 ft. 1½ in., and for the smaller ones 5 ft. 1½ in. The girders are of very heavy construction, being built up with three webs, their depths as mentioned above being 5 ft. and 4 ft. 3 in., respectively.

GALLOWS FRAME FOR SUPPORTING OLD TRUSSES.

During the removal of the top courses of the old piers the old trusses were supported by a gallows frame, consisting of

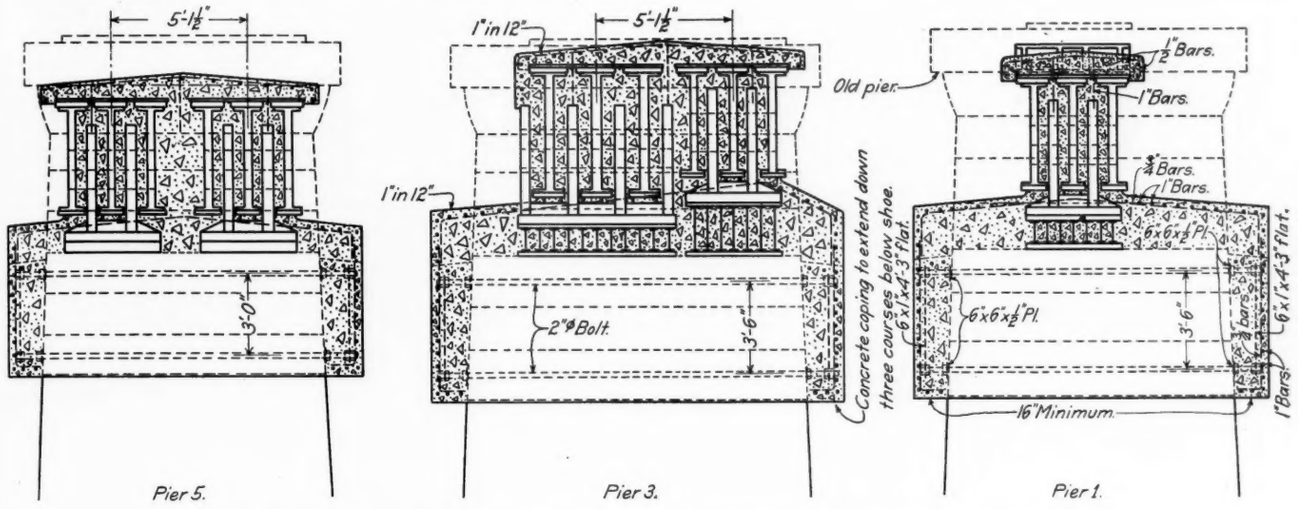


Fig. 5—Sections of Three of the Piers Showing Alterations Made in Cutting Off Old Tops.

upper surface of this concrete is battered 1 to 12 transversely in both directions from the centers of the piers.

The smaller girders are supported on cast steel pedestals having a bearing surface of 3 ft. 10 in. x 8 ft., and the larger ones on pedestals whose bearing surface is 6 ft. x 9 ft., the latter having four vertical ribs for the pin bearing. The pins in both cases are 18 in. in diameter. The outer edges of all the pedestals are thus placed about 1 ft. from the end of the old stone piers, making the distance center to center of pins for the large two built up columns supporting a transverse plate girder with diagonal bracing to give lateral stiffness. Near the top of these columns, hanger bars were connected to support the trusses to be raised. The posts were arranged to take a bearing on the end pins of the trusses adjacent to those which were to be raised, the tops of the posts being inclined towards the truss to be moved so that when they were pulled toward the vertical the truss would be raised off its bearings by means of the hanger bars described. In most cases the bearing for these gallows frame posts was secured by rearranging the packing on the end

Fig. 6—End View from South Showing Material Tracks and Electric Hoist for Raising Materials to the Bridge from the Ground.

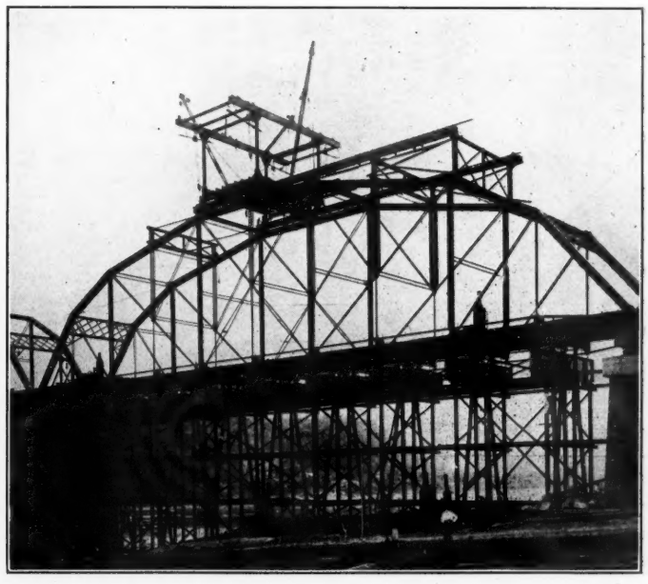


Fig. 7—Old Span 1 Showing False Work Carrying Traffic and Small Traveler Erected on Old Trusses to Place New Span.

pins so as to insert the bearing plates attached to the bottom of the posts. In some cases, however, instead of using bearing plates on the bottom of the posts, short transverse girders were attached to the posts a few feet from the bottom, which were supported by a short column at each end connected to bearing shoes placed on each side of the main truss shoe of the span

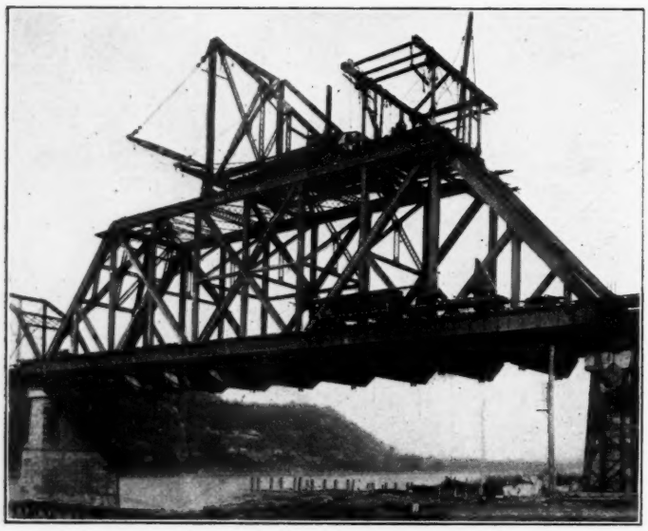


Fig. 8—New Span 1 After Removal of Old Trusses Showing Heavy Traveler Erected for Placing Spans 2 and 3.

adjacent to the one to be raised. The hanger bars were in two parts connected near their lower ends, allowing the lower section to be packed on the end pins of the span to be raised before the gallows frame was erected.

In designing this frame it was planned to tie the top of the frame back to the hip joint of the adjacent truss to hold the span in the raised position. It was found in carrying out the work, however, that it was advisable to lower the truss for each train so that the gallows frame was never allowed to carry the truss under live load. A 100 h. p. electric hoisting engine was kept on the span to raise and lower the trusses as required, using a six sheave steel block attached to the top of the gallows frame. Blocking was kept ready on which to drop the trusses whenever necessary, and they were only raised about 1 in. between trains to clear the wedges.

At the end piers where there were no adjacent trusses to provide a bearing for the gallows frame posts, this bearing was secured by erecting double timber bents back of the piers and placing blocking from the caps of these bents to notches cut in the stone piers on which the bearing shoes of the gallows frame were set. For pier one the gallows frame was guyed to the approach viaduct. It required 130,000 lbs. tension in the six lines to lift this end span.

At the intermediate piers half of the masonry was removed at one operation. The gallows frames were first set on one truss and used to raise the other, while the longitudinal half of the stone pier under the truss thus supported was cut away. The pier girder for this location was then brought out in the river on an old car ferry and hoisted into place by falls from the transverse girder of the gallows frame, outhaul lines being attached to a floor beam of the old structure to hold the girder away from the pier. The smaller girders weighed 87 tons each and required one hour to place. The heavier ones weighed 127 tons each and required only a slightly longer time to place. When this first girder was in place on the new top of pier, the old span was blocked up on it at the proper elevation, the gallows frame was reversed so as to bear on the truss over the completed half of the pier, the other truss was raised, the remaining portion of the stone removed and the other pier girder placed.

Special provision had to be made for supporting the end stringers during the removal of the pier tops at all intermediate piers. During the removal of the first half of the stone, the stringers bearing on that side of the pier were supported by plate and angle shelf connections from the ends of the corresponding stringers of the adjacent span which were still carried on their bearings on the undisturbed half of the pier. After the first girder had been placed the stringers were blocked up from these girders, and the shelf connections were reversed so that these stringers in their new position would support the stringers of the adjacent span while the stone was cut away below them. After the placing of the second girder these stringers were also carried by blocking from that girder and the temporary shelf connections were entirely removed.

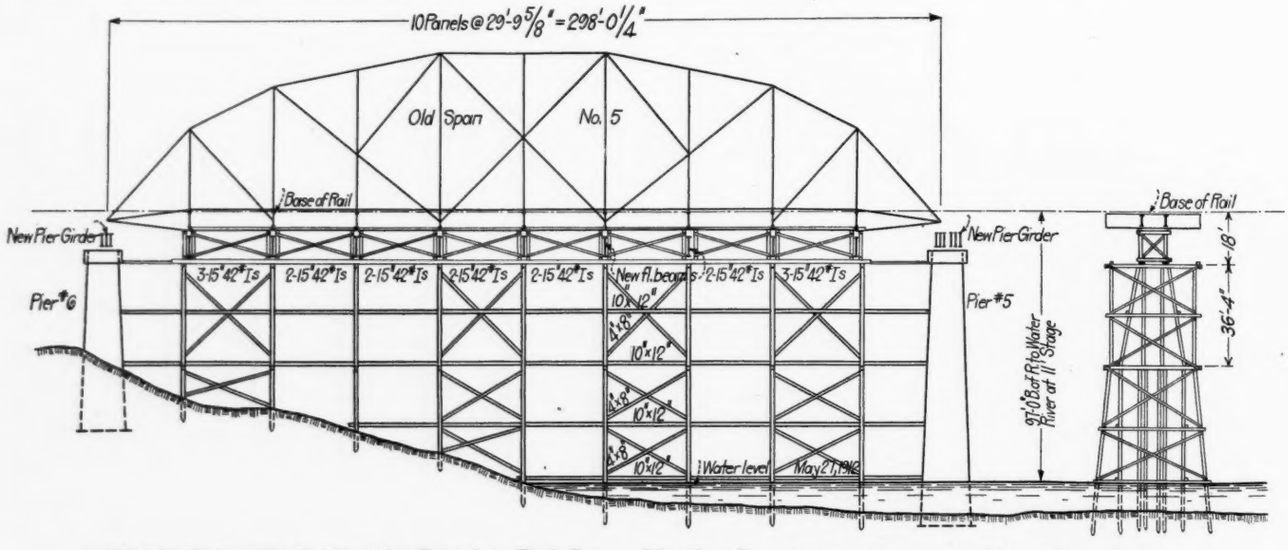


Fig. 9—False Work Used in Erecting End Spans Showing Pony Bents Supporting New Floor Beams.

METHOD OF HANDLING NEW STEEL.

The superstructure of the five river spans required about 10,000 tons of steel and the approach viaduct required about 2,500 tons additional. All steel was delivered to a material yard on the south side, located on a belt line owned by the Norfolk & Western, around the city of Kenova. A stiff leg derrick of 40 tons capacity and a large traveler which was used in the

erection of the Queen & Crescent bridge at Lexington, Ky., were kept in this yard for handling material, unloading from road cars, assembling the parts and loading on material cars for transfer to the bridge. A material track connecting with this steel yard was built along the entire length of the approach viaduct and extended under an electric hoist which was used to raise the steel from the ground to the level of the bridge deck about 50 ft. above. This hoist consisted of two 2-drum, 4-spool engines, each having a capacity of 65 tons and mounted on separate gallows frames which spanned the material track on the ground and a spur track from the main line on the bridge level, being supported on timber bents built up from the ground. One of these frames was fixed and the other was arranged to travel along the supporting bents to allow the handling of pieces of any desired length. The engines also had a transverse move-

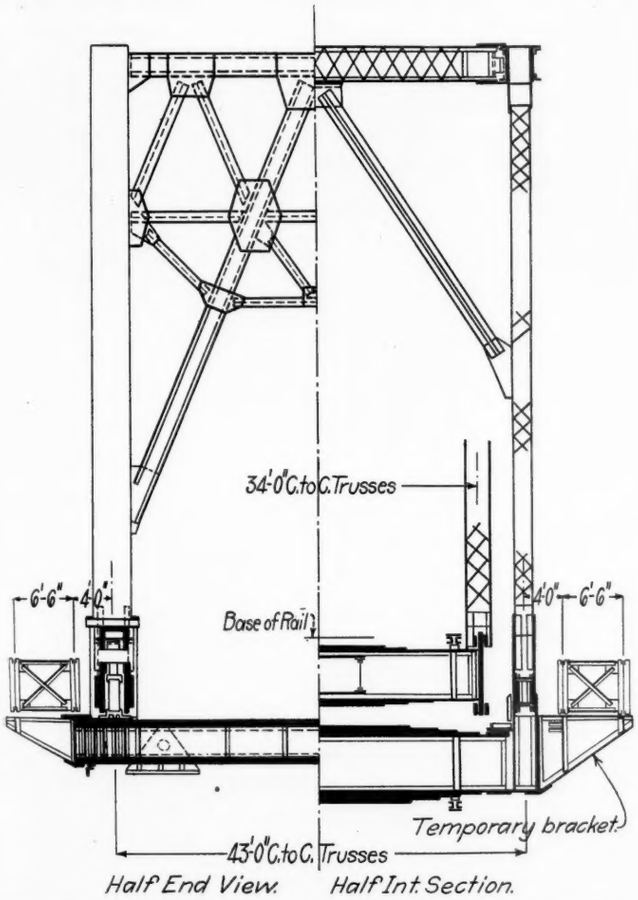


Fig. 10—Elevation and Section Showing Relation of New Bridge to Old and the Temporary Material Tracks Outside of Trusses.

ment on the girders of the gallows frames so that they could first be spotted over the track on the ground and after hoisting the load they could be moved over to a point above the track on the bridge deck, from which they could lower the steel directly to the material cars. The lighter material was brought up on flat cars, a number of which were provided with hanger stirrups for receiving the hooks from the falls of the hoisting engines. The heavy material was transferred from cars or trucks on the lower level to other cars or trucks on the bridge, the pieces that were too heavy for a car being carried on two standard trucks.

The spur track on the bridge level, which was served by the hoist, was connected to the main line just back of the end of the bridge and was also continued across the bridge outside the truss, a similar track being carried across outside of the other truss. These were supported on temporary cantilever brackets from the new floor beams which were erected below the bottom chords of the new trusses. These connections of floor beams and material track brackets were made to temporary gusset plates dropped from the bottom chord. The stringers designed for the new bridge were used during erection in these material tracks, being supported directly on the cantilever brackets, and were transferred from this position in

Fig. 11—Placing End Post of Span 2 by Cantilever Method Showing Erection Ties Between Spans 1 and 2.

the material track to their final position in the floor after the trusses were completely erected, by changing one or two panels at a time, depending on the allowable delay to traffic and the amount of time required to make the change. Since the floor beams were so far below their final position during erection, temporary struts had to be provided to brace the bottom chords against transverse buckling. The material tracks were built

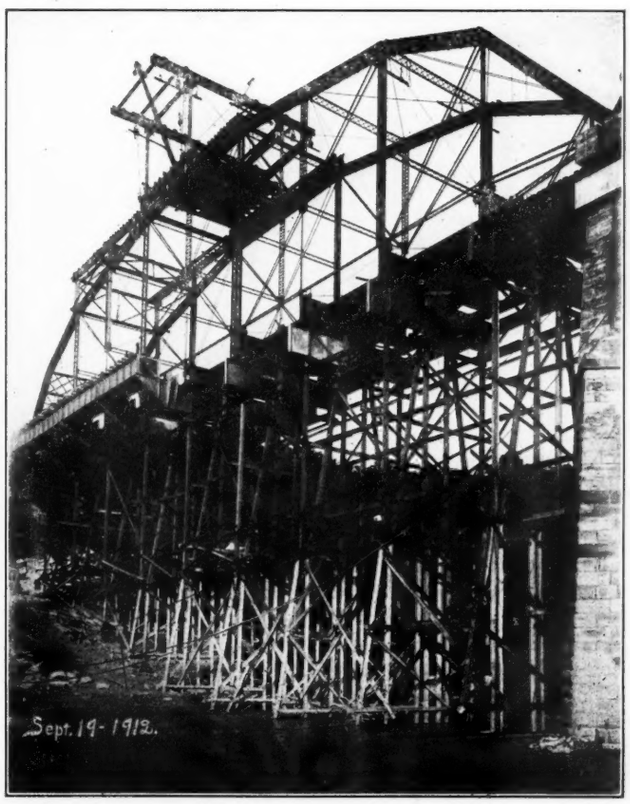


Fig. 12—False Work Under Span 5 Showing Connection of New Floor Beams to Old Ones and the Brackets Supporting Material Track.

from both ends of the bridge as the erection progressed, and connections with the main line were maintained at both ends so that steel brought up on the hoist could be run out on either side of the bridge from that end, or could be carried across the bridge on the main line and out on either material track from the other end. The movements of the dinky engine pushing these material cars were the only movements over the main track required for erection purposes.

Compressed air for pneumatic tools was supplied by a single compressor located on the east shore, the air being carried across the bridge in a 3½ in. pipe. Electric current for operating the motor equipment of the travelers and hoists was secured at 550 volts d. c.

The new steel was erected around the old without any interference with the old superstructure. In general, the bracing

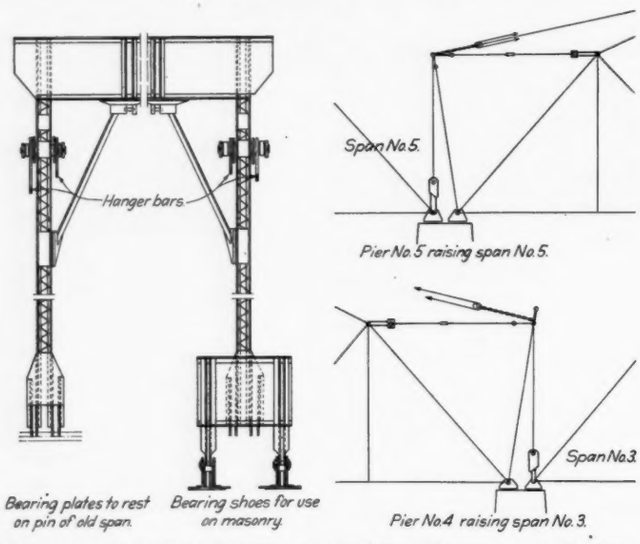


Fig. 13—Half End Views of Gallows Frame and Typical Diagrams of Operation of Lifting Spans.

was so designed as to clear the old steel 12 in. in all cases. Some very careful calculations of deflections of both the old and new trusses were necessary to make sure that this clearance would be secured. In some cases the design provided for the placing of temporary sway bracing, the material removed from old spans being remodeled to suit. These temporary members were kept in service until the old superstructure was entirely removed, allowing the placing of the permanent members.

ERECTION OF TWO END SPANS.

Spans 1 and 5 were erected by travelers placed on the top chords of the old trusses, falsework being provided to carry the live load, and the new span being supported on the old during erection. Bents of eight piles each were driven under the panel points to support framed bents 34 ft. wide at the top with a deck 18 ft. below the base of rail. On this deck two lines of four 15 in. 42 lb. I-beams were laid 8 ft. 6 in. apart center to center, on which were placed pony bents 10 ft. 9 in. high to support the ends of the old stringers. Two pony bents were placed at each panel point as near as possible to the floor beams and suitable longitudinal bracing was put in to connect the two bents under each panel. The stringers were blocked up on these bents and the rivets cut out of the floor beam connections so that all live load was carried through the stringers down into the temporary falsework. The new floor beams were then hung from the old by stirrup hangers of 3 in. rods with cross channels at the top and bottom.

Temporary timber falsework was used on the old trusses to keep the traveler track level. This was carried from the panel points of the old trusses and supported longitudinal I-beams on which the traveler track was laid. The traveler had a boom on each end and also two cantilever arms extending over the material tracks on each side. Two falls were provided on each of these arms, one over the material track and the other over the center line of the new truss. A steel member to be placed was held by both lines, being picked up from the car on the material track by the outer one, drifted over to place and lowered by the inner one. The traveler was equipped with two 75 h. p. engines.

After the new floor beams had been hung, temporary brackets for the material track were attached to them and this track was laid continuously along both sides of the span. It was then possible to spot steel for the trusses on these tracks opposite its final location and the erection of the lower chord and web members proceeded continuously in this manner. Before the erection of the top chords and end posts, the new floor beams were blocked up on the caps of the timber falsework over the outside legs of the trestle so that the falsework would take the additional load imposed by the erection of the top chords and end posts. When the trusses were completed they were blocked up on their own bearings and the old stringers were blocked up on the new floor beams, allowing the new truss to carry the live load. The old truss was then dismantled, piece by piece, down to the floor system, the steel being removed over the material track. Work was carried on simultaneously on spans 1

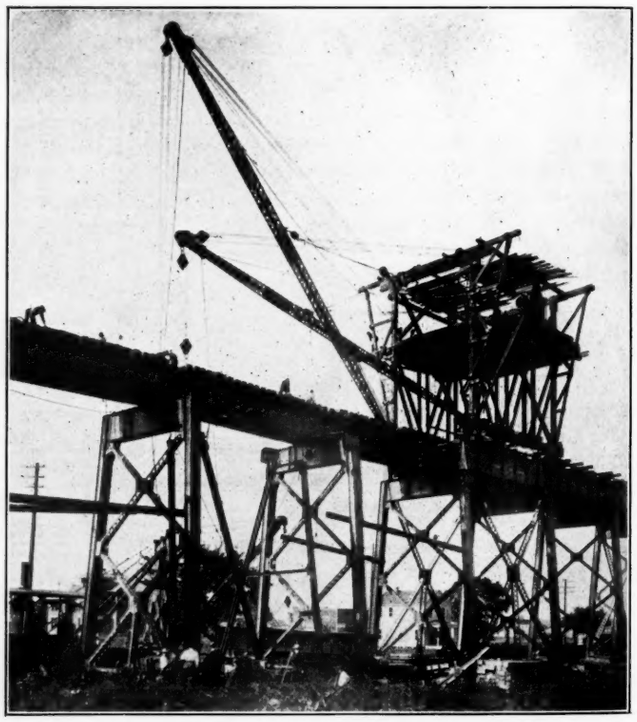


Fig. 14—Erecting New Double Track Viaduct and Removing Old Members Without Interruption to Traffic.

and 5, duplicate travelers being used. Spans 2, 3 and 4 were erected by the cantilever method, the two shorter ones entirely from one end and the longer one from both ends. The heaviest member handled was the end post of span 3, which weighed about 108 tons. Spans 2 and 4 were erected simultaneously by two large travelers of a special design prepared for this bridge. Each of these travelers had two booms with a capacity of 65 tons each at a radius of 75 ft. They were equipped with two 4-drum, 8-spool hoists and 100 h. p. motors. The type of these travelers is well shown in the accompanying photographs. Adjustable legs at the rear of the travelers served to keep the masts vertical while working over the inclined top chords, a condition which is necessary to the successful operation of the revolving boom type of traveler.

ERECTION OF SPANS 2, 3 AND 4.

After the completion of the two end spans, the small travelers used for these spans were left on the top chords of the new trusses as near the outer ends as possible. The large travelers for the cantilever erection of the three central spans were then erected on these new trusses just inside the small travelers which were left in that position during the erection of spans 2 and 4 to serve as counterweights. The end members of spans 2 and 4 and the temporary steel work connecting these spans with the shore spans were placed by the large travelers from the erection position on the end spans, after which they traveled out over the temporary work onto the top chords of spans 2 and 4 as the work progressed.

The connections of the hip ties from the trusses of spans 1 and 5 to spans 2 and 4 during erection were made by round pins and crescent shaped plugs in slotted holes so that when spans 2 and 4 were completed the outer ends of spans 1 and 5 respectively, could be jacked up, allowing the inner ends of spans 2 and 4 to rest on piers 3 and 4, thus removing the tension from the hip ties and allowing the crescent plugs to be driven out. Spans 1 and 5 could then be lowered and the temporary work between the spans removed. The closure of the 518 ft. truss erected from both ends was also accomplished by jacking up the outer ends of the adjacent spans, the difference in length of the chords due to erection stresses being temporarily taken up in the four middle panels of the lower chords which are of I bars. The raising of these spans was accomplished by 500 ton hydraulic jacks, two of which were used under each truss, one under each end of a short transverse jacking girder attached to the end of the lower chord.

The material tracks along the three central spans were erected as each panel was completed so that the members for the next panel could be run out on these tracks and reached by the traveler above. After the completion of the new trusses the old floor beams were cut away from the old trusses and blocked up on the new floor beams which had been erected below the lower chords in the same manner as in the end spans described above. The old trusses were then dismantled and removed, piece by piece, over the material tracks.

ERECTION OF NEW APPROACH VIADUCT.

In connection with the replacing of the bridge, the 2,210 ft. of steel viaduct approach on the east side and a 300 ft. section of similar viaduct over two streets in the town of Kenova were rebuilt for double track. The old viaduct was built with inclined posts, special lugs being provided at the bottom of these posts to receive vertical columns in case it should be desired to double track the structure. The spacing of the pedestals under this viaduct was such that track girders carried on vertical posts would be at the proper distance from the track girders on the old structure to support the outer rails of a new double track.

For much the same reasons that it was decided to replace the bridge, it was also decided to build a new viaduct instead of taking advantage of this feature of the design of the old. The pedestals under the old viaduct were in very good condition, having been recently replaced on concrete piles. In order to utilize these pedestals, a design of viaduct in which the posts have a slight batter was adopted. Under the station platforms the posts are vertical and a third row of columns is provided. It was desired to reduce the grade of this viaduct approach from 0.5 to 0.3 per cent. by raising the east end of the viaduct about 5 ft., and the remainder of it by correspondingly lesser amounts, reaching the old grade line about over the second pier of the bridge.

This change in grade was made before the erection of the new viaduct was begun. A material track was first laid the full length of the trestle and timber blocking was distributed on which the old steel was blocked up to the new grade. The new steel was then distributed along the structure. The two spans next to the bridge were first erected on falsework and the remainder were placed by a two boom traveler operating from the bridge outward on the new viaduct. The new bents were erected complete in the spaces between towers of the old viaduct alongside the old bents which they were to replace. The bracing in one tower of the old viaduct was then removed and temporary 6 in. x 12 in. timbers were placed from the bents of this tower to the adjacent bents of the towers on each side. The traveler then lifted the old girders clear of the old towers with the two booms. With an outhaul line on the ground the old bents were pulled over and the new ones pulled into place, the booms then dropping the girders on the new bents. It required from five to eight minutes to make the change in each bent, and it was possible to allow trains to pass between the placing of the two bents in each tower. The traveler was supported on girders erected over the posts of the new viaduct, sufficient clearance being allowed under the traveler to permit the free operation of trains on the two middle girders which remained in the same position as on the old viaduct.

On account of the change in grade at the Kenova station, which is located at the crossing of the Chesapeake & Ohio just west of the end of the approach viaduct, some alterations to the station were made necessary. A new baggage and express station was built and a new elevator installed for handling this traffic between the upper and the lower levels.

The reconstruction of this bridge was handled under the supervision of Charles S. Churchill, chief engineer, and C. C. Wentworth, principal assistant engineer. J. E. Crawford, acting chief engineer and formerly bridge engineer, was in charge of the design of the alterations to the substructure and the checking of the superstructure. F. P. Turner was the assistant engineer in charge of the work in the field. The methods used were worked up by the American Bridge Company under the direction of C. W. Bryan, chief engineer, and C. G. E. Larsson, assistant chief engineer, F. P. Witmer and Wm. G. Grove being the engineers on the design. The steel work was fabricated at the Ambridge plant. J. B. Gemberling was in charge of the erection, and H. Taylor was the engineer in the field.

A CORRECTION.

Through a mistake the name of the author of the article entitled "Nomographic Method for Finding Center of Gravity and Moment of Inertia," which appeared in the issue of last week, page 381, was omitted. The author was M. J. Eichorn, Chicago, who is entitled to all credit for its preparation.

SOUTH AFRICAN RAILWAY TROUBLE.—Sir David Graaf, acting minister of railways, South African Union, notifies that the government will constitute a commission to inquire into a number of railwaymen's grievances, including the immediate introduction of the eight-hour day, a minimum wage for white employees from $2 upwards per diem, the revision of local allowances, the abolition of piece work, the decentralization of management, and other grievances connected with pay.

RAILWAYS AND THE STATE.—The *Pall Mall Gazette* states that it has reason to believe that the preliminary steps in connection with one of the most important and far-reaching inquiries ever instituted in England has been taken on behalf of the government by the board of trade. During the past few years, in the House of Commons and elsewhere, appeals have been made to the government to endeavor by commission or committee to arrive at a more clear definition of the relations between the state and the railways of the country, both as regards directors and employees. The appeals for such an inquiry have not been confined to any particular section of the country, and railway directors and railway employees have shown no disposition to resent such action.

UNCLE SAM'S FREIGHT CARS.*

By J. GARRETT HILL.

This is an argument in favor of government ownership of railway freight equipment—but not of the railways themselves.

There are those who believe that the time is ripe for our government to take over the railroads. And they also believe that great reductions in rates and fares would result, while at the same time the net revenue accruing to the government after deducting all operating expenses would soon have the coffers of our treasury overflowing.

I shall not stop to deny that government ownership of railroads may become practical within another generation or two. It certainly is not practical at the present time. And it is doubtful if any one living today will ever see the federal government successfully operating the railroads.

It is not my purpose, however, to argue that long step, but a much simpler one of real progress.

Government ownership of railway freight equipment is a very simple solution of our transportation problem. It is entirely practical, and could be put into effect with such ease that it would in no way disturb general business conditions. On the contrary, I believe that the country would enter upon an era of prosperity the like of which we have never known.

That there would be no serious opposition to this plan is evident, because:

It will benefit the shipper, the railroads, the government, and the public.

It will effectually prevent car shortages, and all shippers will be able to secure equipment promptly upon request.

It will prevent any possible chance of discrimination in furnishing equipment.

It will at once put the government in close touch with the movement of all freight traffic.

It will at once give the railroads all the capital they require for increased terminal facilities, additional motive power, and general improvements.

It will not affect the present railroad officers and employees.

It will not materially change the present method of operation.

It will not change the present existing freight rates.

It will not affect present earnings and dividends—except to increase them.

It will not affect the Interstate Commerce Commission.

It will not affect the present ownership of railroad tracks, locomotives, or anything else connected with railroads other than freight equipment.

At the present time there are in use approximately 2,500,000 freight cars which should be purchased by the government at an average price not to exceed $800 per car. This would result in an investment of $2,000,000,000; and to this should be added approximately $1,000,000,000 for storage yards, making the total cost to the government approximately $3,000,000,000.

The storage yards should, of course, be located at various points throughout the United States and accessible to all railroads, so that cars could be furnished to any line promptly upon request and returned to the government yards by the railroads when not in use.

The charge to be made by the government for the use of equipment is, of course, a matter of detail to be worked out. But I personally consider fifty cents per car per day, plus one cent per car per mile, a fair charge. (At the present time the railroads have in effect a *per diem* rule whereby they pay forty-five cents per car per day for all foreign cars on their line; and they pay owners of private car lines three-fourths of a cent or more per mile for the use of their cars.)

The charge of fifty cents per car per day would be sufficient to insure the prompt handling of all cars by the railroads; for the transportation department of the various lines would be anxious to get the cars off their rails at the earliest possible moment in order to be relieved of this charge.

*Reprinted by kind permission from *Everybody's Magazine* for September.

The average movement of a freight car (including periods of idleness) is about twenty-four miles per day; based upon this, and assessing charges as mentioned above, the earnings of the government would be as follows:

Daily Earnings.

2,500,000 cars at 50 cents per car per day	$1,250,000.00
2,500,000 cars at 1 cent per mile per car, av. 24 miles per day	600,000.00
Total daily gross earnings	$1,850,000.00

Annual Gross Earnings.

2,500,000 cars figured on above basis	$675,250,000.00

EXPENSES UNDER GOVERNMENT OWNERSHIP.

Initial Expense.

2,500,000 cars at $800 each	$2,000,000,000.00
Cost of storage yards (estimated)	1,000,000,000.00
Total initial cost	$3,000,000,000.00

Annual Expenses.

$3,000,000,000.00 at 4 per cent interest per annum	$120,000,000.00
Cost of upkeep and operation, including salaries, etc	80,000,000.00
Total annual expense	$200,000,000.00

From this you will note the annual gross earnings are $675,250,000, while the total operating expenses, including interest on original investment, are only $200,000,000. Thus the net revenue accruing to the government, after deducting all expenses, reaches the stupendous total of $475,000,000 per year.

This would at first appear to be an excessive charge, and you might infer that the present earnings of the railroads would be greatly reduced. Such is not the case, as the earnings would be considerably greater than at the present time: for sufficient equipment could be had at all times by the railroads, whereas under the present system the loss to the lines each year through lack of equipment is enormous.

This loss to the railroads also means a great loss to the shippers and consumers: The shipper loses the sale of his goods or, should the goods be perishable, loses the goods themselves; while the consumer's loss is measured by the difference in the price he is obliged to pay on account of the demand for the article he desires being greater than the supply, and this condition, when traced back, is found to be due to the fact that the railroads were unable to furnish equipment to bring the goods to market.

In addition to this the railroads and the public suffer a great loss every year on account of insufficient terminal facilities. This is due in large measure to the lack of sufficient funds; and many are the companies who are today endeavoring to increase their capital stock, or issue bonds and notes, to invest in improved terminal facilities.

Government purchase of freight equipment would at once give the railroads ample capital not only to increase their terminals, but also to meet all demands in the way of improvements for years to come—besides leaving a large surplus in their treasury.

As a concrete example of what this would mean to the railroads, take, for instance, the Pennsylvania, east and west, which has in use at the present time 246,665 freight cars. These cars, purchased at $800 each, would give the Pennsylvania a total of $197,332,000, or $23,812 per mile for their freight equipment, all or any part of which they could invest in improved terminals and other betterments.

Or take one of the smaller lines, such as the Buffalo, Rochester & Pittsburgh. It now has in use 17,741 freight cars, for which it would receive from the government $14,192,800, or approximately $24,000 per mile of road.

This change would enhance the value of railroad securities, as the earning power would be greater for reasons above explained, and with increased earnings come increased dividends—which in turn result in higher values of securities.

Further, this would enable the railroads to progress at once beyond a point that under present conditions will take them fifty years to reach. And the American people would enjoy a railroad service the efficiency of which could not be improved upon. At the same time the net income to the government would exceed one million dollars per day, while the railroads would be operating under less expense than at the present time.

AIR BRAKES AND MODERN CONDITIONS.*

A Study of the Effects of Changes in Railway Operation and Heavy Passenger Train Cars on This Equipment.

By Walter V. Turner and P. H. Donovan,
Of the Westinghouse Air Brake Co.

I doubt if, outside of the locomotive, there is anything that can make more money for the railroad in certain sections of the country, and particularly in congested districts, than the brake. On the other hand, no matter where the brake is used, whether in congested districts or not, there is nothing that can lose more money or cost more than the brake, if the proper brakes are not used in the first place and not properly cared for in the second place. The reason will be apparent when the tremendous energy that has to be dissipated in stopping or controlling a train of today is considered.

The money making power of the brake is well illustrated in the case of the New York subways. In 1910 it was desired to increase the train capacity. They were considering putting on larger motors in order to get a speed of 60 m. p. h. instead of 40, and therefore get over the road in shorter time. That looks perfectly natural, and yet as a matter of fact under those conditions they would have actually consumed more time between stations than with conditions as they were, for when the speed of a train is doubled it takes four times the distance to stop, and in this case it would require more than twice the distance to stop. Then it was suggested that better brakes be used and stop sooner or in shorter distances. The time saved by deceleration has a value equal to that saved by acceleration and a much more rapid rate of deceleration was obtainable, thereby increasing the capacity. This more rapid rate of deceleration was obtainable by making a greater use of the potentiality of the rail. It may not have occurred to many people, but the rail is the starting point for the brake. The basis of the whole matter lies with the rail, and it is only by measuring the rail capacity that the possibilities of stopping can be determined.

With the better brakes the time of stopping was cut down to one-half of that previously required and the emergency stop was cut from 650 to 350 ft., so that the signal space could be shortened, and together the capacity of the subway was increased about 40 per cent. per day. This shows what can be done with the brake. It cost some money to do this, but not one-twentieth of what it would have cost to have obtained the same result by other means.

With such tremendous energy as we have today to cope with, braking is an important problem, particularly when the time element is considered, which is the most important element in the air brake. There are many, even among railroad men, who fail to take this into consideration. The engineer on the engine looks at his gage and thinks that what takes place on the head end takes place at the rear end at or about the same time, while, as a matter of fact, the brakes may be full set on the head end before they have commenced to apply at the rear, and on long freight trains even before the twentieth brake has commenced to apply.

While we find railroad men in all other departments of railroad activities writing and discussing upon the various interlocking and interdependent physical equipments and scientific development of the organization, I cannot call to mind any railroad man who has discoursed very much upon the subject of brakes, and from this I am led to conclude that either they do not realize the tremendous importance of this wonderful safety device, or that it is the important dividend earning asset, or, that the subject is too complex and involved for them to take the time to know it as thoroughly as they do other phases of their duties, or apparatus that goes to make up the physical equipment of a railroad, or that they are willing to leave all consideration of the brake equipment and train control to the air brake man, or air brake engineer, as I hope some day to hear him called, of the road.

To the end then of a better understanding of why the changed conditions and rolling stock affect the efficiency of the air brake, I beg to call attention to the following factors:

The Element of Time
- (a) Service Operations.
- (b) Emergency Operations.

Flexibility—The Importance of
- (a) Factors of.
- (b) Time.
- (c) Auxiliary Reservoir.
- (d) Piston Travel.
- (e) Braking Force.

Foundation Brake Gear.
- (a) Single shoe gear.
- (b) Double shoe gear.

Brake Shoes.
- (a) Some of the characteristics of.

All of the above apply, to a more or less degree, to passenger and freight car brakes.

High Pressure Brakes for Passenger Cars.
- (a) Velocity.
- (b) Mass.
- (c) Acceleration.
- (d) Retardation (Rail) for often it is the rail that determines the minimum stop possible is, in fact, the starting point of the brake.

Empty and Load Brake for Freight Cars.
- (a) Empty weight of car and its braking force. (Whenever the term braking power is used it should be understood as synonymous with braking force.)
- (b) Loaded weight of car and its braking force.
- (c) Level track—necessity for uniform braking force on.
- (d) "Grades"—necessity for sufficient braking force.

Hand Brakes.
- (a) Empty cars.
- (b) Loaded cars.
- (c) Effect of high capacity cars on the hand brakes.

Locomotive Brake Appliances.
- (a) Compressor.
- (b) Main, or Storage Reservoir.
- (c) Governor.
- (d) Engineer's valve used for manual operation of the brakes.
- (e) Brake Apparatus.

Electrical Attachments for the Operation of Pneumatic Brakes.
- (a) Energy.
- (b) Acceleration.
- (c) Retardation.
- (d) Grade.
- (e) Concussion.

So much for the brakes considered individually. Then they must be considered collectively, for the operation, and perhaps all of the preceding considerations, may be greatly changed and, in fact, are changed by the combination in the many different ways and under the multitudinous conditions possible; therefore, we have to consider, in this engineering problem, the length of the train; the weight of the train; greater frequency of trains, and the effect of these things on the efficiency of the apparatus due to the larger volume of air to be handled and the time element necessarily involved; the shocks produced by the enormous energy necessarily inherent in long and heavy trains under move-

*Abstracted from the April 25, 1913, Proceedings of the Railway Club of Pittsburgh.

ment; the air supply required, which, obviously, is greater with every vehicle added to a train; the larger apparatus required for the heavier cars; the effect of the lapse of time between the application of the brakes on the head end and the rear end of the train; the difference in time between the releasing of the brakes on the front and rear end of the train, and last, but not least, the possibility of the personal equation being equal to the many degrees of manipulation required and its ability to properly judge the right thing to do for each condition or occasion.

Then come the problems of installation, maintenance, and the information to be given the men of the different departments under which come the apparatus, and, of course, the instructions, general and particular, to all concerned.

The work required in stopping a train consisting of 2 locomotives weighing 194 tons each and 10 passenger cars weighing 75 tons each from a speed of 80 m. p. h. is better appreciated when it is considered the same amount of work would be performed by lifting a weight of 1 ton over 48 miles in the air, or the energy dissipated in stopping this train would run one of the large steel street cars in Pittsburgh for a distance of 66 miles, or if this retarding force were applied to a projectile as it left the mouth of a 14 in. gun it would travel but 1,050 ft., as compared with an actual travel of 25 miles.

The foregoing illustrations clearly show the conditions as far as magnitude is concerned, and as the controlling of such enormous masses when in motion is certainly as important as to give motion itself, it is obvious that the controlling mechanism is of vital importance, if not in the last analysis entirely the determining factor, as to whether or not such development is permissible.

PASSENGER SERVICE CONDITIONS.

Considering for the moment passenger equipment only, natural improvement, combined with the effort of railroad companies to attract business by superior equipment, and the demand of the traveling public for greater comfort when traveling, shorter schedules (higher speeds), and at the same time greater safety, has led to the development of heavier rolling stock. These cars and locomotives are of such weight that they cannot be as efficiently braked with the older type of air brake equipment as could the rolling stock of years gone by.

The following example will show what the increase in the weight alone means to the operating department if it is to accomplish a presumably desirable result. Under former conditions, the factor of safety in train handling was none too great, and it is, therefore, imperative that we should be able to control modern trains under present existing conditions, at least as safely and effectively as formerly.

To do this for twelve 150,000 lb. passenger cars running at 60 m. p. h., it is necessary to provide means for controlling over 200,000,000 ft.-lbs. of energy as compared with 6,000,000 ft.-lbs., which was what the brakes of 30 years ago were called upon to control, with a train of five 30,000 lb. cars running at 35 m. p. h. When the locomotive used with each train (one for the early and two for the modern conditions) is considered, the total energy in the modern train becomes 373,086,394 ft.-lbs., as compared with 9,800,000 ft.-lbs. for the trains of 30 years ago.

It is not surprising, therefore, that the air brake art demands thoughtful consideration from trained and experienced minds if the railroad traffic of today is to be handled with a safety and efficiency equal to that of the days when the total energy to be reckoned with was one thirty-eighth as great.

Contrasting the modern Pullman car weighing 150,000 lbs., and having six-wheel trucks, with the earlier passenger car having four-wheel trucks, and assuming that from a speed of 60 m. p. h., the stop should be made in 20 seconds, the work done would be 37.5 foot-tons per brake shoe per second, or over three times that of the earlier train, notwithstanding that there are twelve brake shoes to do the work instead of eight. The use of two brake shoes per wheel is rapidly becoming a necessity, not only on account of the great amount of work to be performed by each brake shoe, but also because the brake shoe pressure required by modern conditions, high speeds, and heavier cars, becomes so enormous that in emergency applications too great pressure is brought to bear on the pedestal and journals by the brake shoes acting on one side of the wheels.

The tremendous significance of this increase is but faintly appreciated by those who have not had occasion to investigate this aspect of the question. The cast iron brake shoe is today practically as it was thirty years ago. This brake shoe must now do four times the amount of work by frictional resistance to the rotation of the wheel, as formerly. It may be suggested, "Why not quadruple the pressure per brake shoe?" But it also must be remembered that when the brake shoe pressure is multiplied by four, the actual retarding force is by no means quadrupled, for three vital adverse factors are being overlooked, viz., the effect of increased pressure, speed and time on the coefficient of friction (because of heat) between the wheel and the shoe. Also, that the brake shoe wear increases very rapidly with extremely high temperatures, and if for no other reason, it would warrant the expense of a two shoe per wheel installation for the saving in brake shoe wear and maintenance for the modern passenger train condition.

IMPROVED PASSENGER BRAKE EQUIPMENT.

While the fundamental service and emergency features of the quick action brake could not be departed from on account of the necessity for maintaining interchangeability of apparatus and operative functions, it was clear that in designing a brake to meet these new conditions not only must the fundamental features of the old brake be improved to their highest possible efficiency, but new features must be added, some of which were inherently impossible if the design were carried along the lines previously laid down.

Briefly stated, the recognition of the higher efficiency and added means required by the changed conditions referred to led, in case of the passenger brake, to the incorporation of the following features in addition to those characteristic of the previous form of equipment.

1. Quick rise of brake cylinder pressure so that the braking force may reach its maximum in the shortest possible time and thus begin to be effective in reducing the speed when at its highest value—and when the increase in distance run before coming to a stop is greatest for every second's delay.

2. Uniform braking force on all cars, irrespective of size of equipment and variation in piston travel, thus contributing largely to the convenience and comfort of passengers, as well as making the brake more reliable and therefore easier to manipulate.

3. Maintenance of both service and emergency brake cylinder pressures up to the capacity of the ample storage reservoirs of the cars. This is of the greatest advantage in overcoming the ever-present and often serious depletion of brake cylinder pressure by packing leather leakage.

4. Predetermined and fixed limiting of maximum service braking force, without a safety valve or other blow-off device. This maintains the proper margin between the force of service and emergency applications and tends to reduce wheel sliding without wasting air and with a minimum of apparatus, thus resulting in economy both of operation and maintenance.

5. Quick service feature to compensate for increased length of train and bring about more prompt, uniform and certain application of brakes.

6. Quick recharge of the auxiliary reservoirs to offset longer trains and larger cylinders and reservoirs and insure a prompt application of the brakes when desired and prevent the depletion of the auxiliary reservoir pressure.

7. Graduated release feature to add to the flexibility of the brake by making it possible to graduate the brakes off as well as on and so to handle the train more smoothly, with a greater

saving of time, and a reduction in the amount of wheel sliding.

8. Much higher brake cylinder pressure obtained in emergency for the same brake pipe pressure carried, which pressure is maintained and retained during the complete stop, thus materially shortening the stops and adding greatly to the safety of the trains.

9. Automatic emergency application on depletion of brake pipe pressure. This is a safety and protective feature of great value, in that it insures sufficient braking force being automatically obtained to bring the train to a stop in case the system is depleted below a predetermined pressure either by careless manipulation or accidentally.

10. Full emergency braking force at any time, thus placing the maximum stopping power the brake has to offer at all times ready for use by the engineer whenever an emergency arises, irrespective of what may have preceded.

11. Separation of service and emergency features so that the necessary flexibility for service application can be obtained without impairing in the slightest the emergency features of the equipment and conversely, so that undesired quick action is practically impossible.

12. High maximum braking force secured with low total leverage, with correspondingly greater over-all efficiency of the brake.

Controlling means for passenger cars should not be dismissed without a reference to operating the mechanism by electricity. Actuating the brakes electrically results merely in the elimination of the time element of application, the retarding force coming solely from the pneumatic operation. The heavier vehicles and lengthened trains have vastly increased the energy to be controlled and magnified the time element necessarily involved in so doing it. With this end in view, great improvements have been made in the purely pneumatic brake, but full attainment is only possible when the pneumatic brake is operated electrically, as by this means the time element between the first and rear of the train is reduced, and the degree of retardation best suited to speed can be measured to a degree.

It is seldom that any one device or appliance offers the solution of so many problems, overcomes so many difficulties and at the same time utilizes such a vast energy that now is dangerous or goes to waste.

This system eliminates time as far as brake initiation and propagation is concerned.

It eliminates retardation shocks since it reduces brake operation as closely to the effects as though one vehicle only was being retarded.

It reduces the human equation to a very low factor, as it is so promptly responsive and flexible that correction of errors of judgment in manipulation can be made before inconvenience can occur.

It is free from many of the shortcomings of other brake equipments, special care being taken to insure its immunity from influences (which unavoidably exist) that cause brake operations contrary to what are contemplated or when not desired.

It increases the safety of train operation because full emergency braking force is available and obtainable always and is instantaneously effective.

For "service" (station stops, etc.) operation, it is especially valuable from a revenue standpoint, as it permits of stops being made in much less time with a reliability, smoothness and accuracy heretofore impossible.

It permits of accurate, instant and comprehensive communication between the engineer and train crew, or vice versa, thus contributing largely to co-operation and efficiency.

It is reliable, adaptable and complete.

What this progress in passenger brake development represents in increased economy of train operation depends upon the view point, that is to say, if cost of change is to be the determining consideration then the improvement possesses no value to the one who so considers; if, however, he desires to secure the economy and increased efficiency arising from such development, it can be obtained in various ways. As, for example, if the power consumed be kept the same with the shorter stop economy along the following lines is implied: (1) Higher average speeds, (2) shorter schedules, (3) for the same number of cars increased traffic capacity, (4) for fewer cars the same traffic capacity. If it is desired to secure economy by a reduction in power consumption, this can be accomplished, still retaining (1) the same average speeds and (2) the same schedules and capacity.

Assuming the stop to be reduced from 40 seconds to 20 seconds, it is obvious that it is possible to run with power on for 20 seconds where before the train was run with brakes on for this same 20 seconds. If the train does not accelerate while this power is on, a saving in running time between stops of 10 seconds is made. (If the train accelerates, a greater saving is made.) Assuming the trip to be two hours long when making 40-second stops and 100 stops to be made, reducing the time of stop to 20 seconds results in reducing the time of the trip to 1.44 hours. That is, while the old train was making one trip, the new train would make 1.39 trips. Or if both trains consisted of 5 cars, in one day these 5 cars with the new train would have a value of 62 cars as compared with a value of 45 cars with the old train, and assuming 60 passengers per car the new train would be capable of carrying 3,720 people per day as compared with 2,700 people per day with the old train, or an increase of 38 per cent. From this example it will be seen that under conditions of congested traffic, a brake of maximum efficient design will add as much to the carrying capacity of the road as would the purchase of numerous vehicles (2 for the example taken), which, however, it would not be possible to operate because the old brakes do not permit of the required headway, etc.

As to emergency applications, we assume the stop to be reduced one-half. It is obvious that the same margin of safety could be obtained with the headway cut in two making it possible to run twice as many trains as is possible with the longer stop and still retain the same safety factor.

From another view point, as we have seen, economy may be secured by reduced power consumption. The following calculations are submitted to indicate what this economy may be under the conditions as assumed.

In suburban passenger train service train movement consists essentially of a period of acceleration and a period of deceleration, time between stops being the sum of these two. *If time between stops remain constant and the period of deceleration be shortened by the use of improved brake equipment, it is possible to introduce a period of coasting.* A period of coasting implies a lower maximum speed which permits of a shorter accelerating period or allows steam (current) to be cut off sooner. It is evident that a *reduced steam (current) consumption* gives a *reduced coal consumption.* The following calculations indicate what the reduction might be.

CONDITIONS.

Average distance between stops, 1.3 miles.
Average speed between stops, 24 m. p. h.
Average time stop with old equipment, 50 seconds.
Average time stop with improved equipment, 25 seconds.
Weight engine and tender, 136,000 lbs.
Number cars in train, 8.
Weight per car, 80,000 lbs.
Train resistance during acceleration, 10 lbs. per ton.
3.5 lbs. coal per i. h. p. hour.
Efficiency from cylinders to crank pins, 85 per cent.
Number accelerating periods per run, 12.
Actual length run, 17 miles.
Total runs per day, 75.
Cost of coal, $2.50 per ton.
Trains operated 18 hours a day.

COAL USED WITH OLD EQUIPMENT.

1.3 miles ÷ 24 m. p. h. = 195 seconds between stops.
195 — 50 = 145 seconds time train accelerates.

$$\frac{\text{Maximum Velocity}}{2} \times 145 + \frac{\text{Maximum Velocity}}{2} \times 50 = 1.3 \times 5{,}280.$$

Maximum Velocity = 70.5 ft. per sec. = 48.0 m. p. h.
Maximum Velocity is attained in 145 seconds.
Acceleration = 48.0 ÷ 145 = .33 m. p. h. per sec.
Weight train = 136,000 + (8 × 80,000) = 776,000 lbs.

$$\text{Accelerating force} = \frac{776{,}000}{32.2} \times \frac{.33 \times 5{,}280}{3{,}600} = 11{,}700 \text{ lbs.}$$

Force necessary to overcome train resistance, accelerate moving parts, etc. =

$$\frac{766{,}000}{2{,}000} \times 10 = 3{,}830 \text{ lbs.}$$

Total force to move train at rate indicated =
11,700 + 3,830 = 15, 530 lbs.
Horse power at average speed of 24 m. p. h. =

$$\frac{15{,}530 \times 24 \times 1.47}{550} = 1{,}000 \text{ h. p.}$$

I. h. p. at 85 per cent. efficiency = 1,000 ÷ .85 = 1,180 i. h. p.
Coal consumption = 1,180 × 3.5 = 4,120 lbs. per i. h. p. hr.

$$\text{Coal consumption per acceleration} = 4{,}120 \times \frac{145}{3{,}600} = 166 \text{ lbs.}$$

Coal consumption per run = 166 × 12 = 1,999 lbs.
Coal consumption per year = 1,999 × 75 × 313 ÷ 2,000 = 23,400 tons.

COAL USED WITH IMPROVED EQUIPMENT.

195 seconds between stops as with old equipment.
195 — 25 = 170 seconds time of combined acceleration and coasting.
Maximum velocity = m. p. h. per sec. times time of acceleration.
Assume m. p. h. per sec. same as with old equipment = .33 m. p. h. per sec.

$$\frac{\text{Max. Velocity}}{2} \times \text{time of acceleration} + \text{av. velocity coasting} \times \text{time of coasting} + \text{av. velocity deceleration} \times \text{time of deceleration} = 1.3 \times 5{,}280.$$

From above, time of acceleration = 126 seconds.

$$\text{Coal consumption per acceleration} = 4{,}120 \times \frac{126}{3{,}600} = 144 \text{ lbs.}$$

Coal consumption per run = 144 × 12 = 1,730 lbs.
Coal consumption per year = 1,730 × 75 × 313 ÷ 2,000 = 20,300 tons.

SAVING IN COAL.

Tons per year old equipment	23,400
Tons per year improved equipment	20,300
Saving	3,100 tons.

3,100 tons at $2.50 per ton = $7,750.

RETURN REALIZED ON INVESTMENT.

18 hours ÷ 75 trains = .24 hours between trains average.
17 miles ÷ 24 m. p. h. = .708 hrs. per trip one way.
.708 × 2 ÷ .24 = 5.9 = 6 trains.
Allow two trains for uneven spacing.
Total trains = 8.
Cars per train = 8.
Total cars required for service = 64.
Assume old equipment to be returned and improved equipment to be put on at $200.00 per car.
Cost improved equipment = 64 × 200 = $12,800.
Return on investment = 7,750 ÷ 12,800 = 60.5 per cent. per year.

While these calculations assume certain conditions of operation, it must not be thought they are in any manner exceptional, for there is no operation but what can be improved in earning capacity to a greater or less degree by taking advantage of modern brake apparatus.

NEW LINE FOR INDIA.—A concession has been granted for constructing a light, feeder railway, 2 ft. 6 in. gage, from Jacobabad, on the Northwestern State Railway, to the town of Kushmore, about 77 miles distant. It is estimated that owing to the flat nature of the country through which the line will pass, and the total absence of any expensive bridgework, the line can be constructed at the low cost of $5,353 per mile, excluding rolling stock, but including junction arrangements, shipping platforms, locomotive and car shops at Jacobabad. Rolling stock will be provided by the company according to the requirements of traffic; but it is not proposed to expend more than about $2,800 a mile on rolling stock at first. By keeping capital cost at these low figures, it is anticipated that shareholders will receive a good return soon after the line is opened, with fair prospects of still larger returns as the country is further developed.

PRINCIPLES OF ELECTRIC RAILROADING.*

BY C. L. DE MURALT,
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IV.

In looking into any railway electrification problem the first step to take is to calculate the force which is required to move the trains.

In the last article of this series (*Railway Age Gazette*, August 8, 1913) it was shown how this force, generally called "tractive effort," can be computed if the train weight is known, and the various other factors which influence the train movement, such as average weight per car, train speed, etc. The following formula was found for this purpose:

$$f = W\left(2 + 0.1\,V + \frac{90}{W'} + 100A + 20\,p\right) \qquad (4)$$

where f is the tractive effort in pounds, if W is the weight of train in tons, V the speed in miles per hour, W' the average weight per car in tons, A the rate of acceleration in miles per hour per second, and p the grade in per cent. including effect of curvature.

The second step is the determination of the weight which must be placed on the drivers of the locomotive in order to make it possible for the engine to produce the required tractive effort.

In this connection it was shown that there is a very simple and direct relation between tractive effort and required weight on drivers.

This relation can be expressed by the formula:

$$W'' = \frac{f}{0.22} \qquad (6)$$

where W'' is the weight on the drivers in pounds, if f is the tractive effort in pounds. In other words: To produce a certain number of pounds of tractive effort, we must place at least four and one-half times as many pounds on the drivers.

In the majority of cases the required weight can be placed on the drivers of a single locomotive, but it was found that there are at least two sets of conditions which may make this difficult. The first set presents itself in all cases where extremely high rates of acceleration are desirable, for instance, in high speed, frequent stop, passenger service. The second set is found where a railroad has very steep grades. In either case the tractive efforts may be so high that the corresponding weight cannot readily be placed on the drivers of a single rigid wheel base. In that event, the use of multiple unit locomotives or of motor car trains becomes essential.

The third step in the calculation of the horse power output which the engine or motors must be capable of giving in order to develop the tractive effort at the desired speed.

HORSE POWER.

The introduction of the term horse power is necessary, because it is conceivable that a locomotive may be heavy enough to give the required tractive effort and yet not possess power enough to actually exert that effort and move the train.

There are really two limits to the work which a locomotive can do:

First, there is a limit to its tractive force. This depends on the weight placed on drivers.

Second, there is a limit to its speed. This depends on the size and output of the steam engine or electric motor, as the case may be.

To obtain the best results, weight on drivers and motor output must be properly balanced. The locomotive must be heavy enough so as not to slip its wheels when the desired tractive effort is developed, and the engines or motors must be of sufficient capacity so as to actually be capable of giving this tractive effort at the desired speed.

A locomotive is called under-powered if its motors cannot do

this. It is called over-powered if it does not have sufficient weight on drivers to allow its motors to develop their full output. The usual practice is to make a locomotive slightly over-powered, rather than under-powered.

In the case of the steam engine this is taken care of by dimensioning the steam cylinders so that

$$f = \frac{p\,d^2\,s}{D}$$

where f stands for the maximum desired tractive effort in pounds, p for the mean effective steam pressure in pounds per square inch (which is generally taken as being equal to about 85 per cent. of boiler pressure), d for the cylinder diameter in inches, s for the length of stroke in inches, and D for the diameter of the driving wheels in inches.

This formula is based on the fact that the work performed by one piston in a single stroke is equal to

$$p \frac{\pi d^2}{4} \times s$$

If the engine is a simple two cylinder machine, there are four strokes per revolution. Therefore the work performed by the engine as a whole during one revolution is equal to

$$p\,\pi\,d^2 \times s$$

During one revolution the engine will traverse a distance of πD inches, and, inasmuch as equal amounts of work are performed when products of force times distance are equal, we have:

$$f \times \pi D = p\,\pi\,d^2 \times s$$

and therefore:

$$f = \frac{p\,d^2\,s}{D} \text{ as above.}$$

A steam engine dimensioned in this manner will have an output:

$$O = \frac{\frac{p \times \pi\,d^2 \times s}{12 \times n}}{33{,}000} \text{ horse power.}$$

Similar means are used to determine the dimensions of steam cylinders in the case of compound engines, but it is not necessary to go into the matter at this point. Suffice it to say that the engine part in a well designed steam locomotive is always made sufficiently powerful so that there is no question about its being able to develop the required tractive effort.

It is necessary to arrange likewise in the case of an electric locomotive.

Steam engines have their output directly proportionate to steam pressure, cylinder volume and number of revolutions per minute. The output of electric motors is determined by the dimensions and the arrangement of the copper conductors which are used in their winding. This is a rather intricate point of design and it is beyond the grasp of most of us. Luckily, however, it is not necessary to be an electric motor designer in order to determine whether a certain motor is powerful enough for the service or not. It is largely a question of its being able to get rid of the heat which is produced by the electric current as it passes through the motor windings.

Electric motors are customarily sold on the basis of being able to develop a certain number of horse power without heating beyond a certain temperature, say 75 degs. C., which has been found in long practice to be sufficiently low so that no part of the motor will suffer any injury.

It thus comes down to the point of determining the number of horse power which are required to move the train.

The term horse power as a measure of machinery output was introduced by Thomas Savery, the inventor of an earlier type of steam engine. James Watt adopted the term for expressing the power of his machines and he established its present day value by means of experiments which were made under the direction of himself and of Boulton, his business partner, about the year 1775.

Some heavy London brewery horses were caused to raise a weight from the bottom of a deep well by pulling horizontally on a rope passing over a pulley. It was found that a horse could raise a weight of 100 pounds while walking at the rate of 2.5 miles per hour or 220 feet per minute. This is equivalent to 22,000 foot-pounds per minute. Watt added 50 per cent. to this value so that the purchasers of his engines might have no ground for complaint, and thus established a value of one horse power = 33,000 foot-pounds per minute, which has since been in general use in England and the United States.

If the output of a horse is called one horse power when it exerts a force of 150 pounds while traveling at a speed of 2.5 miles per hour or 220 feet per minute, then our problem is to establish what will be the horse power output of a locomotive when it exerts a force of f pounds while traveling at the speed of V miles per hour or v feet per minute.

If we designate the horse power output of the locomotive by O, then we have:

$$O = \frac{f \times v}{33{,}000} = \frac{f \times V \times 5{,}280}{33{,}000 \times 60}$$

$$\text{or: } O = \frac{f \times V}{375} \text{ horse power} \qquad (7)$$

where f is the tractive effort in pounds and V the speed in miles per hour.

This value O gives us the output for which the engine or motor of the locomotive must be designed.

RELATION OF HORSE POWER TO WATT.

In modern calculations the term watt is frequently used in place of horse power as a measure of machinery output. For this reason it may be well to point out the relation which exists between the two terms.

The watt is a unit in the so-called "C. G. S." (Centimetre, Gramme, Second) or "absolute" system of physical measurements. One watt is defined as being equal to ten million dyne-centimetres per second.

The dyne is the unit of force and is defined as that force which, acting during one second on a mass of one gramme, will give it a velocity of one centimetre per second. One gramme equals 0.0022046 pounds. One centimetre equals 0.3937 inches. The weight of the gramme varies from place to place. At 50 degrees latitude and sea level, or approximately under the conditions under which Watt made his historical experiments to determine the horse power, we have:

$$1 \text{ dyne} = \frac{1}{981} \text{ grammes} = \frac{0.0022046}{981} \text{ pounds}$$

1 dyne-centimetre = 0.00000007373 foot-pounds

and: 1 watt = 10,000,000 dyne-centimetres per second = 0.7373 foot-pounds per second

Further up it had been established that:

1 horse power = 550 foot-pounds per second

Therefore we have the relation:

$$1 \text{ horse power} = \frac{550}{0.7373} = 746 \text{ watts}$$

$$\text{or: } 1 \text{ watt} = \frac{1}{746} = 0.00134 \text{ horse power}$$

This is the relation which has been recognized by English and American engineering societies and by the U. S. Bureau of Standards. In other countries the equivalents are only approximate, due principally to the difference in the value of gravity, but the discrepancy is not very great.

The watt is an interesting unit from the electrician's viewpoint, because

1 watt = 1 volt x 1 ampere.

Thus the electrician can more readily change mechanical values into electrical values if he uses the watt instead of the horse power. This explains why the term watt is more appreciated by electrical than by mechanical engineers, even though Watt himself was a mechanical and not an electrical man.

It will be noticed that the watt is a pretty small unit compared with the horse power. For sake of convenience it is therefore often best to use a multiple of the watt, namely, the kilowatt.

1 kilowatt = 1,000 watts = 1.34 horse power. (8)

A RECORD SHIPMENT BY PARCEL POST.

A recent Associated Press despatch carried the news that a record shipment by parcel post had been made from Farmington to Gallup, N. M. This shipment affords a striking illustration of the results that may arise from the recent order of the postmaster general increasing the parcel post weight limit within the first and second zones from 11 to 20 lbs.

The first and second parcel post zones include all territory within any quadrangle representing an area having a mean radial distance of approximately 150 miles from the center of the quadrangle. Under the order of the postmaster general, which was issued on July 25, and went into effect on August 15, the rate on a 20 lb. shipment within the first and second zones is 24 cents. It will be noted that this rate does not apply for moving goods a maximum distance of 150 miles, but for moving them between points not more than 150 miles apart geographically, or "as the crow flies." Farmington and Gallup, being less than 150 miles apart, lie within the first and second zones. Evidently J. G. Hastings of Farmington had taken pains to inform himself regarding all these facts, for on August 16, the day after the order of the postmaster general went into effect, he delivered at the postoffice at Farmington for transportation to himself at Gallup a shipment of 240 20-lb. boxes of fresh fruit. There is no direct railway line between Farmington and Gallup. Therefore, under the requirements of the Postoffice Department this shipment of 4,800 lbs. was carried by parcel post by the Denver & Rio Grande 359 miles to El Moro, Colo., where it was transferred to the Santa Fe. The latter road carried it 429 miles further to Gallup, where, under the Postoffice Department regulations, it was required to deliver the fruit from its station to the postoffice. The transfer of the shipment at El Moro caused a delay of twelve minutes to one of the Santa Fe's best passenger trains, No. 9, and its unloading at Gallup caused another delay of ten minutes, a total delay to the train, involving inconvenience to the passengers as well as expense to the railway, of 22 minutes. At Gallup, in order to make delivery of this same shipment to the postoffice, it was necessary for the Santa Fe to use two extra trucks and four men—two of them for 45 minutes and the other two for 30 minutes each. On the following day the same shipper consigned 80 boxes, or 1,600 lbs. of fruit from the same origin to the same destination, which was, therefore, handled by the same railways in the same way.

The two shipments amounted to 6,400 lbs., or over three tons. The regulations of the Postoffice department evidently are predicated on the theory that 24 cents is a reasonable rate to be charged by the department for transporting 20 lbs. of goods a maximum of 150 miles. Because of the circuitous route by which these shipments were made the department received an average of only 4.5 cents for moving each 20 lbs. each 150 miles of the distance.

However, the department fared better than did the railways, which really rendered the service. The department got a total of $76.80 for handling the two shipments. The railways, which carried these more than three tons of perishable goods almost 800 miles, received practically nothing for the service rendered by them. The law provides that the postmaster general shall readjust the compensation to be paid to the railways for carrying the mails on weights taken for not less than 90 days at least once in four years. The postmaster generals have adopted the policy of weighing the mails only once in four years, and basing the compensation of the railways for all the succeeding four years on this quadrennial weighing. When Congress passed the parcel post law everybody foresaw that it would cause a large amount of shipments to be diverted from the express and freight cars to the mail cars, but the only provision Congress ever has made for paying the railways for handling the traffic thus transferred to the mails, is that their total compensation for carrying the mails might be increased on July 1, 1913, a maximum of 5 per cent. As the parcel post traffic has increased the mail service rendered by the railways much more in proportion than this, the amount paid to them is wholly inadequate to offset the loss of revenue that they have suffered as a result of the diversion to the mails of much traffic which formerly moved by freight or express. On the basis merely of the cost per mile of moving mail cars the operating expense incurred by the railways in handling these shipments of fruit from Farmington to Gallup was at least $100; and this includes nothing for overhead charges, such as return on investment, or for the expense incurred in delivering the fruit from the Gallup station to the postoffice. Adding these would make the total expense incurred by the railways about $140, which is not far from twice as much as the revenue received by the postoffice department. If, in addition, there be added the expense incurred by the postoffice department in handling the shipments, it will be seen that the parcel post rate was probably not one-third large enough to cover the total cost of the service rendered. The present express rate between Farmington and Gallup is $4.40 per 100 lbs. The Interstate Commerce Commission, in its recent order, holds that a reasonable rate is $2.95. If this is a reasonable rate by express it must be a reasonable rate by parcel post, but the parcel post rate applied on these shipments figures out only $1.20 per 100 lbs. It is, therefore, evident that the government could not by any possibility handle the business except at a heavy loss if it paid the railways a reasonable compensation for the services they render in handling the parcel post traffic; and railway men suspect that it is a realization on the part of postoffice department officers that the parcel post rates are entirely unremunerative that causes them to delay readjusting the mail compensation of the railways.

Belgian Railways for China.—M. Devos, representing the Belgian syndicate which secured the concession for the Kweichow Lauchow Railway, has, it is reported, signed another important contract, which provides for the construction of a railway from Kwei-hua-cheng to Tatung, Tai-yuan and Cheng-tu, a distance of over 1,000 miles.

Important Colombian Line Proposed.—The Congress at Bogota is said to have authorized the Columbian government to construct a railway which will connect the Magdalena river with northern Santander Department, with its terminus at San Jose de Cucuta, Colombia. Efforts have been made for over 50 years to secure construction of some sort of a transportation route that would bring Cucuta into closer communication with the interior and more heavily populated portions of Colombia. Should this road be constructed and the short remaining distances between Medellin and Cali be closed, Colombia would have a transcontinental railway and river connection from east to west, which could not fail to be an important factor in the development of the entire country. It is not known whether the government will undertake the construction of this road on its own account or whether it will grant a concession therefor to foreign capitalists.

New Line for Honduras.—The railway from Truxillo to Juticalpa, Department of Olancho, Honduras, with branch line to Tegucigalpa, will be constructed by the Truxillo Railroad Company, an American corporation in which the United Fruit Company is substantially interested. The railway will probably be built along a different line from that of the old Honduras National Railroad, and new material from the United States will be used. Work was begun on June 25, and it is intended to complete the line to the Aguan river—about 11 miles—by the end of this year. A 50-foot wharf for landing material has been built, and the right of way toward the Aguan river is being cleared. The terminal and permanent wharf will be located at the part of Truxillo Bay known as the Rincon which is considered an excellent place for a wharf, at which large steamers can lie sheltered against practically all weather. This point is about five miles from the city of Truxillo, to which a spur will be built.

ALASKA'S NEED OF RAILWAY DEVELOPMENT.

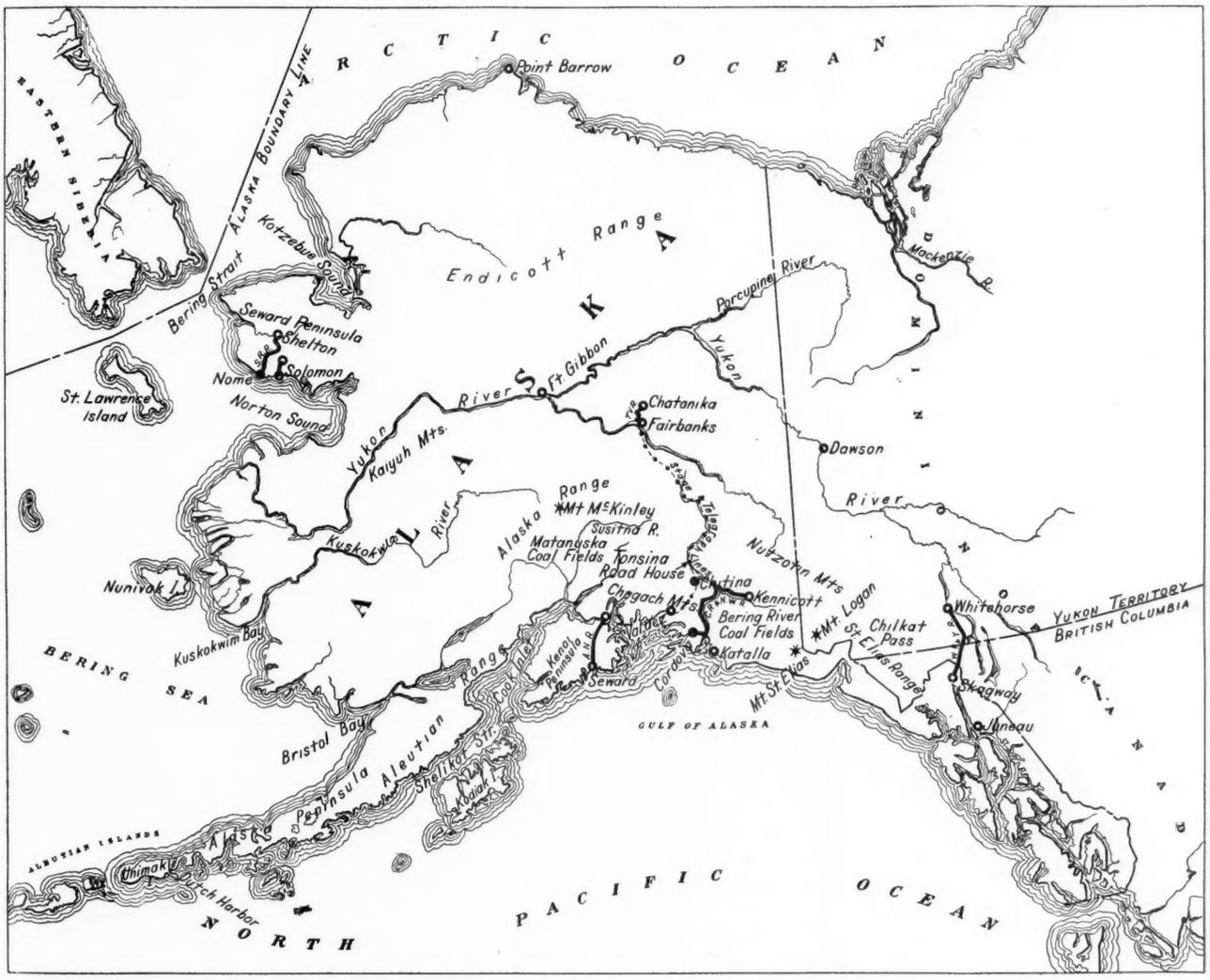
Inadequacy of the Existing Lines and Proposed Improvements to Open Up the Great Natural Wealth of the Region.

By E. E. Swergal,
New York Central & Hudson River.

Much has been written and said regarding the need of transportation development in Alaska. Regarding all great questions, agitation and interchange of views in a reasonable measure are desirable, but there is always a point where these should end and decisive action begin. That point has already been reached in the controversy regarding the development of transportation in Alaska. Probably a large majority of the writers and politicians who have written of and discussed

months of personal observation and investigation are necessary before one can arrive at reasonably safe conclusions regarding the internal questions, and the climatic, domestic and business conditions involved.

Let us briefly review the history of transportation development in Alaska; what has been accomplished and what remains to be accomplished. We will go back to the building of the White Pass & Yukon, the first railway in Alaska.



Alaska, Showing the Few Railroads Now in Operation.

Alaska's transportation question, and other internal affairs, have never even visited Alaska.

I will venture the assertion that there are not more than five newspaper and magazine writers of those who have written and talked upon the subject, who could be considered competent to judge. Of these five, two are American magazine writers of national reputation. Of the political men of prominence who have written of or discussed the question within the last three years, five or six only have visited the country, and of that number four remained only a few days in the coast section, which is the part of Alaska upon which the controversy has centered. In Alaska, as in any frontier country,

The discovery of gold placers in the Yukon valley, and the consequent influx of a large population resulted in the building of the White Pass & Yukon, a narrow gage line, in 1898-1900, to a point on the head waters of the Yukon river, from which stern-wheel steamers connected with the noted placer town of Dawson in the Canadian Yukon, at that time the chief center of gold production. This line extends 112 miles in a northeasterly direction from Skagway, Alaska, which is situated at the head of Chatham strait (commonly known as Lynn canal). Only 25 miles of this railroad is within Alaska, the greater portion being in British Columbia and Yukon territory, with a terminus at the town of White Horse.

With the discovery of the Fairbanks, Alaska, gold area, the copper belt of the Chitina river, the coal deposits at the head of the Matanuska river and in the vicinity of Cordova, and the oil deposits near Katalla, there came a popular demand for an all-American route from the southwestern coast of Alaska to the interior.

Here a brief sketch of the physical geography of the southwestern coast is necessary to a clear understanding of the difficulties encountered in the projection of railway lines into the interior. Generally speaking, this is a bold curve, swinging northwest from the islands of southeastern Alaska, then in a generally westerly direction, embracing the islands of Prince William sound, and finally sweeping southwesterly along the Alaska peninsula and the Aleutian islands, the western-most islands being within a few hundred miles of the Kurile islands of Japan.

This crescent configuration of coast line is shown on the accompanying map and largely governs the northeasterly flow of the warm Japan current, which results in greatly modified climatic conditions in Alaska, not generally found in far northern latitudes.

About 50 miles back from the coast along Prince William sound the Chugach mountains parallel the coast line, rising to an altitude of from 5,000 to 8,000 ft., from which innumerable spurs project to the ocean, where they present precipitous faces and form an irregular broken country studded with many glaciers of varying size. The culminating peak of these mountains is St. Elias, which rises to an altitude of 18,000 ft., and the largest glacier is the Malaspina, which has a sea frontage of 40 miles. So absolute has been this mountain barrier to communication between the coast and interior that even the fauna and flora are different, and it has even affected the migration of the Indians and the dissemination of their languages.

Through this coast several railroads have been projected and championed, those most discussed having their initial points at Katalla, Cordova, Valdez and Seward. These coast towns are twelve to fifteen hundred miles distant from Seattle by sea. Of the several railroads projected, two only have been built and operated through this coast range, the Copper River & Northwestern and the Alaska Northern, both standard gage lines.

The tidewater terminus of the Copper River & Northwestern is at Cordova on the easterly shore of Cordova bay, a commodious and land locked harbor which affords facility for commerce at all seasons of the year, and at all stages of water. The main line extends from Cordova in a northeasterly direction through the Copper river valley, to the town of Chitina. At this point, 132 miles from the coast, a branch extends in an easterly direction through the Chitina valley to the Kennecott copper mines, 65 miles distant at the head of the Kennecott river. At Chitina connection is made with the military sled and wagon road over which stages are operated to the well known mining town of Fairbanks, situated about 300 miles north on the Tanana river above its confluence with the Yukon. From mile 38 on the main line surveys have been run to the Bering river coal fields across the Copper river delta, a distance of about 50 miles.

This railroad is on a water level grade, and of a high order of construction, modernly equipped for operation, and with but little interruption successfully carries passengers, freight and mail throughout the year. It is noted for its engineering and scenic features, a combination of which is much in evidence at the third crossing of the Copper river on mile 49, where a $1,500,000 cantilever, steel bridge carries the line across the stream, which here passes diagonally between the noted Miles and Childs glaciers. Modern steel bridges are also located on miles 27, 30 and 149; the latter being a cantilever bridge 250 ft. above the gorge of the Kuskulana river.

The tidewater terminus of the Alaska Northern is at Seward, Kenai Peninsula, on the northwest shore of Resurrection bay (a splendid all-year harbor), and by steamer about 150 miles west of the noted mining town of Valdez. The line has been constructed and operated a distance of 70 miles in a northerly direction from Seward, and has afforded facility of movement for prospectors and miners developing the country tributary thereto. In a measure, it also serves those who are interested in the agricultural possibilities of the Susitna river district to the north. This river has its head waters immediately to the east of Mt. McKinley in the Alaskan range.

In a program of construction to the interior, the lines already constructed could properly serve as entrances from the coast, with any additions and betterments that may be found necessary, and with the construction of laterals to permit of development of the coal deposits. To the north of the coast mountains through which these railways have been built, a generally rolling tundra surface country is encountered. Reconnoissance lines have been run through this inland country, and it has been roughly estimated that construction to the Tanana and Yukon rivers will cost $25,000 per mile.

There are one or two short narrow-gage lines in Alaska, which are of no real importance and which have no bearing on the general development question as it is now understood. One of these lines is the Tanana Valley Railroad, which runs from Fairbanks to Chatanika, and which serves locally between Fairbanks and the placer creeks. This line might possibly be connected up with the north and south lines to be built into Fairbanks, but this is not very probable, because the Tanana valley is narrow gage. The Solomon River Railroad is also a short narrow-gage line and runs from Nome to the local mining fields. This line only operates during the three summer months.

Space forbids extended remarks bearing upon the engineering and physical difficulties which were encountered in the construction of the railroads referred to, but it is not extravagant to say that from time to time, in various ways, action of a Napoleonic character was required, and at no time did the men engaged show a disposition to evade the issue. Many of the original questions of engineering and construction have now been solved by the men who pioneered the way, and upon this foundation of recorded experience the men who follow can solve their problems more rapidly, and perhaps obtain results at less financial cost and personal hazard than those who preceded them.

These railroads were financed by private capital and although costing many millions of dollars, and much personal anxiety and hardship to the officers and their subordinates, the enterprises were indirectly hampered in various ways through the agency of unscrupulous or uninformed magazine and newspaper writers, and by subtle and self centered politicians.

The federal government has not encouraged private enterprise in the development of transportation, and supplementing this indifference it has placed an unjust burden on development by the imposition of a mileage tax of $100 per mile of main line built and operated. One of the lines referred to (200 miles long), is thus compelled to pay the federal government $20,000 per year, notwithstanding the heavy expenses of maintenance and operation encountered in a country of this character, which can only be partially supported by light traffic earnings derived from an undeveloped country.

Regarding the pointed question as to who can best develop the transportation for the common good of all, it appears to be the consensus of opinion of the men who know the country best that the work should be continued by private enterprise, as has been permitted in the states, and with equitable financial assistance and regulation by the government. The Interstate Commerce Commission now has jurisdiction in Alaska, and considering the agitation that has been engendered by this question, there is little probability, if any, of corporation abuses being practiced or even attempted in the future. Many of the railroads built in the states were liberally assisted by the government, therefore, why should not assistance (stripped of political and financial abuses) be extended to private railway enterprises in Alaska?

As regards actual construction and ownership by the govern-

ment, some people raise objections, generally to the effect that the cost would impose an indirect and unprofitable burden upon the tax payers of the United States proper, inasmuch as the development is wholly within Alaska and ostensibly for the direct benefit of its people. This primary objection sounds substantial at first thought but when facts and figures are analyzed the results do not support it.

It is commonly known that Alaska was purchased from Russia in 1867 for $7,500,000. Since then there has been taken out of the territory not less than $350,000,000 in diversified products, mainly gold, copper, furs and fish, a profit on the purchase of approximately 4,500 per cent. This profit has been absorbed in the national wealth of the United States through various avenues of commercial interchange. There remains in Alaska great potential wealth in the same products, and in addition thereto the anthracite and bituminous coal deposits are untouched, lack of development alone standing between the coal and the warming of homes and production of energy for industrial purposes along the Pacific seaboard of the United States. This coal will tend to lessen the cost of domestic and commercial fuel by reason of additional competition in the market.

As regards possibilities of agriculture in the districts adjacent to railroads already built and proposed, there is some doubt as to the successful production of grains; corn probably never will be grown because of the absence of long hot seasons so indispensable to the growth of this product. Wheat, oats, and barley have been experimented with in the Tanana and Susitna valleys for the purpose of home consumption, and although some success has been obtained, there is ever present the hazard of destruction by frost due to the shortness of the summer season. Grass grows rapidly and in abundance during the early summer, and there is no doubt but that with proper attention sufficient hay can be produced for domestic purposes. The government has established experimental agricultural stations in the districts susceptible to cultivation, but it remains to be seen whether or not grains can be grown with certainty.

As regards the climatic effects upon railroad operation in Alaska, experience has demonstrated that operation can be successfully conducted, and although intermittent interruption has occurred on the lines already under operation during the winter months, the hazard and interruption has not been more serious, if as much so, as in the operation of lines during winter months through the mountainous sections of our western states.

Through the coast ranges of Alaska snow rotaries are necessary for operation during a portion of the winter, usually in January, February and a portion of March. This necessity, however, will become less marked as the hazardous points are determined by experience, and fortified by sheds, fences, grade reinforcement, or other improvements. Beyond the mountain ranges trains are being successfully operated during the winter months with the aid of pilot plows and flangers only, as the snowfall rarely exceeds two or three feet in the valleys, which is much less than the precipitation encountered, in the form of rain or snow, along the coast. This disparity is accounted for by the prevailing warmth along the coast due to the influence of the Japan current.

Regardless of obstacles encountered up to the present time in the maintenance and operation of Alaskan railroads, there is much hope for the future, as experience has demonstrated that all railroads, wherever their location may be, during early years of maintenance and operation are subject to trouble in greater degree than is the rule in later years, when sufficient time has elapsed to permit of substantial adjustment through a gradual co-ordination of physical features.

Reverting to the question of government ownership, the government has expended many millions of dollars, and many lives have been lost in the military and civil administration of the Philippines, Hawaii, Porto Rico and Cuba, in the development of the islands for the direct benefit of alien people, with no substantial proof that its efforts have been understood and appreciated, and with no assurance that in the end a reasonable profit will be realized on the expenditure.

Contrast this with what we have found in Alaska. Alaska has already contributed immensely to our national wealth and there still remains vast wealth to be developed. It is a "white man's country" in every sense that the term implies; there is no country where white men grow hardier and healthier. These men have undergone hardships as did the pioneers in the early days of our western states, and in return they have been neglected, even imposed upon, by their government.

Summed up, the burdensome results of national political quarrels and governmental indifference have fallen upon the people of Alaska to such an extent that many of them have been forced by idleness to leave the country, many have failed in their small business enterprises, mining development has been seriously retarded and the development and extension of railroads discontinued. The present population does not exceed fifty thousand, including native Indians and Eskimos, and this in a country famed for its natural wealth and in extent of territory one third of the size of the United States proper.

What is needed as a remedy is the adoption by the government of a definite and businesslike development program, embracing five general items: (1) Early development of railroads by private enterprise, assisted and regulated by the government, or wholly undertaken by the government. (2) Revision of mining laws, particularly coal land laws, to permit of practical and early development. (3) More liberal appropriations to the army engineers (who have charge of highways and telegraph and cable lines), to enable them to effect a more rapid extension of trails, and for the substantial bridging of streams at dangerous fords. (4) A comprehensive plan for additional fixed aids to navigation along the coast. (5) Construction of fortified coaling bunkers for naval and merchant vessels at a practicable harbor on the southwestern coast. The latter item is a gravely important one when we consider the possibility of an American-Asiatic war. Results of expert investigation have demonstrated that Alaskan coal is as good for steaming purposes as are the best qualities of coal found in the eastern states.

Railroads, however, are the first and most important need, for without them the potentiality of the country cannot be developed. In view of the nominal amount Alaska cost us, considering the immense profit we have already derived, and well knowing what the country still holds in store for us, why should we hesitate longer to substantially aid in the work of development?

We should no longer hesitate! The necessity for decisive action has long since confronted us, and we should now act with decision and good judgment to the credit and profit of ourselves and posterity.

TRANS-SIBERIAN RAILWAY.—At a recent railway conference the representative of the Canadian Pacific Railway asked that the Korean railways should be connected with the regular through services of the Trans-Siberian Railway, and that the same arrangement should be effected with the railways of Northern China. This proposal has now been adopted, and Seoul and Peking are now on the regular round-the-world itinerary via Russia and Canada.

RAILWAY IMPROVEMENTS IN EGYPT.—Due to Lord Kitchener's initiative a great number of construction works are to be undertaken in Egypt. A new railway line, the exploitation of which has been intrusted to the Egyptian Delta Light Railways, is to unite Dessouk with the region of Foua-Metubes, in the delta. A bridge is to be built across the Nile between Metubes and Edfina. Another bridge to cost $2,000,000 will cross the Nile between Dessouk and Rahmanieh. Other new lines in course of construction are those between Menouf and Kafe-Zayat and between Tantah and Zagazig. These will traverse two of the most fertile districts in the delta.

VALUATION OF KANSAS RAILWAYS.

In accordance with an enactment of the Kansas state legislature passed in 1911, the work of valuing the railway properties within the state as they existed on June 30, 1911, is now being carried on under the direction of the Public Utilities Commission. The first report of the work done to November 1, 1912, prepared by C. C. Witt, engineer of the commission, has recently been published and the following is abstracted from this report.

In carrying on this work the various lines were divided into convenient sections approximately 100 miles long, and the physical items were reported by the roads on blanks furnished by the commission in rotation for each section, beginning at one end and proceeding to the other, each section being complete in itself except as to equipment items, which will be reported for the entire line in Kansas on the basis of the locomotive or car miles made in that state to that made on the entire system. This inventory is required in duplicate, one copy of which is to be filed in the office of the commission and to constitute the railway company's appraisal, while the other is to be used by the engineering department in checking the items in the field.

Right of way maps and profiles covering the entire lines within the state, also blue prints of both the substructure and superstructure of large bridges, standard plans of pile bridges, stock yards and track construction, copies of recent construction contracts and final estimates or other special data that will assist in the determination of a correct and reasonable appraisal, were furnished to the commission by the railways.

To insure uniformity of work the railways operating in this state organized an association and have held frequent meetings, at some of which representatives of the commission have been present. In this way many disputed points have been settled in advance, and the work has been materially simplified.

As soon as the inventories prepared by the railways are received they are carefully checked on the ground by the engineers of the commission, who travel over the line on foot or on gasolene motor cars, making necesssary corrections. After this inspection is completed, the report is brought into the commission's office and cost prices assigned to each item. Quantities of grading are calculated from the profiles and right of way acreages from the maps.

The aim of the commission has been to secure the cost of reproduction new and the present physical value. It is hoped to secure the original cost later. In discussing right of way, the report states: "If the appraisal is of 'the cost to reproduce new,' land must be treated as any other item and an estimate made of the cost of securing the right of way, including all severance and other damages, as if the present right of way, station grounds and terminals were not owned by the company but had to be secured by the methods commonly pursued, all improvements and conditions of abutting property being as they actually exist at the date of appraisal. "If the appraisal is of 'the present physical value,' the element of time or past existence of the property as railroad right of way must be considered. The land itself has increased in value in proportion to the increase of abutting property, but the money paid for severance damages, engineering, legal expenses and other expenses of acquisition has not increased and should be stated as of original cost. When once accounted for, this item is settled for all time."

For the purpose of securing the present market value of the right of way and station grounds, if they were devoted to other purposes, the assessed value of all farm land through which the railway extends and of all abutting lands in towns and cities was secured from the Tax Commission and the records in each county. Records of all bona fide sales and assessments years of lands for the last three in the vicinity and of classes similar to those occupied by right of way, were also secured. To determine the amount of probable damages to be paid by the railway, or of multiple cost, records of purchases of right of way and condemnation suits for a number of lines were compiled, and the resulting figures compared with the market value at the time of the purchase of the land through which the railroad passes. From these figures it appears that the total cost of the right of way for extended sections ranged from 2¼ to 2½ times the market value of the property through which it passes, while individual tracts ranged from donations to 10 times the market value. It was also found that the multiple was larger for farm property than for town property. In small towns and villages the multiple was about 2½; in towns of 10,000 population, a little over 2; while in cities of over 100,000 population, from 1½ to 2.

In depreciating roadway items, the present physical value was determined by inspection, supplemented by theoretical life tables. An item of 4 per cent. of the cost of all roadway items and right of way was added for engineering and engineering superintendence. The present physical value of equipment was determined by depreciation tables based on a study of the average life of a large amount of equipment. An allowance of 9½ per cent. was made for general expenditures, including legal expenses other than those charged to right of way, taxes and assessments levied on the property while under construction, interest during construction, and contingencies. Nothing was allowed for adaptation and solidification of roadbed or for any intangible values.

At the time of this report, the appraisal of the Union Pacific was completed and a general summary is given herewith, the estimated cost to reproduce new per mile being $37,156 and the estimated present physical value $27,459 per mile.

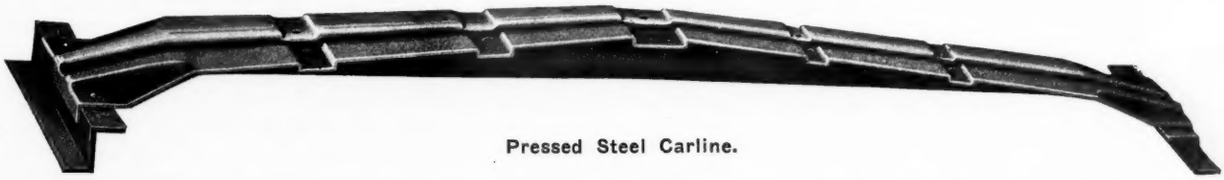
COST TO REPRODUCE NEW AND PRESENT PHYSICAL VALUE, PER MILE, OF EACH ITEM.

Miles first main track	1,187.42
Miles second main track	66.87
Miles passing and sidetrack	251.75
Miles joint track (0.82)	.41
Total	1,506.45

	Road.	Reproduction cost, new.	Condition, Per Cent.	Present physical value.
1.	Engineering and engineering superintendence	$857.32	100.00	$857.32
2.	Right of way and station grounds	2,723.05	100.00	2,723.05
2a.	Severance and other land damages	3,873.73	.....	320.47
3.	Real estate	914.97	100.00	914.97
4.	Clearing, grubbing, grading and protection	4,351.24	99.92	4,347.80
6a.	Truss, plate girder and I-beam bridges	1,589.26	87.02	1,382.98
6b.	Pile bridges and timber trestles	603.97	71.31	430.68
6c.	Culverts	479.75	78.32	369.19
7.	Ties	3,249.39	56.68	1,841.92
8.	Rails	4,093.94	81.57	3,339.67
9.	Frogs and switches, railroad crossings	141.38	78.89	111.54
10.	Track fastenings and other material	955.94	82.39	787.62
11.	Ballast	662.26	84.51	559.68
12.	Tracklaying and surfacing	1,619.85	60.94	987.18
13.	Roadway tools	15.58	70.01	10.91
14.	Fencing right of way	246.19	71.56	176.17
15.	Crossings and signs	90.05	69.88	62.93
16.	Interlocking and other signal apparatus	136.88	91.34	125.02
17.	Telegraph and telephone lines	88.00	72.20	63.54
18.	Station buildings and fixtures	639.13	68.09	435.24
20.	Shops, engine houses, turntables and cinder pits	343.72	63.69	218.93
21.	Shop machinery and tools	183.74	55.20	101.43
22.	Water stations	374.96	80.21	300.79
23.	Fuel stations	56.91	69.60	39.61
31.	Stockyards, snow fences, and miscellaneous structures	358.98	75.03	269.36
35.	Earnings and operating expenses during construction	282.04	74.99	211.53
	Total road items	$28,932.23	72.55	$20,989.53
	Equipment.			
37.	Steam locomotives	$1,847.43	56.86	$1,050.45
39.	Passenger-train cars	705.57	74.72	527.20
40.	Freight-train cars	1,731.52	68.38	1,184.01
41.	Work equipment	630.45	66.31	418.05
	Total, equipment items	$4,914.97	64.70	$3,179.71
	General Expenditures.			
43.	Law expenses	$144.66	100.00	$144.60
44.	Stationery and printing	10.00	100.00	10.00
45.	Insurance	10.00	100.00	10.00
46.	Taxes	67.69	100.00	67.69
47.	Interest and commission	1,015.42	100.00	1,015.42
48.	Other expenditures, contingencies, etc.	1,861.59	100.00	1,861.59
	Total, general expenditure items	$3,109.36	100.00	$3,109.36
49b.	Stores and supplies, material, etc., for use in Kansas	200.00	90.00	180.00
	Grand total—			
	Per mile of first main track	$37,156.56	73.90	$27,458.60
	Per mile of all tracks	29,287.72	73.90	21,643.56
	If Section No. 1, Kansas-Missouri state line to Topeka, which includes all the double track in this state and the extensive terminals and shops at Kansas City, Kan., is excluded from above totals, the total per mile of first main track will be	31,104.95	75.36	23,442.03
	Total per mile of all tracks	26,668.84	75.36	20,098.78

PRESSED STEEL CARLINES.

A new style of pressed steel carline has recently been designed by the Cleveland Car Specialty Company, Cleveland, Ohio, for use with steel side plates in car framing. It is necessary that the carline should rest flat on the side plate with a large bearing surface, and the design here shown is now being placed on a large number of cars. While this type is intended for steel framing, it is equally applicable to cars with wood side plates. A recent test of this carline showed that it required a pressure of over 4,500 lbs. to deflect it when placed upon supports representing the side plates. The use of pressed steel has made it possible to produce a design of carline in which the maximum strength is gained with a minimum weight, as the whole carline can be made from one piece of steel and the metal placed where it is most needed. It is stated that many thousands of Cleveland carlines are now in use, and that no failures have yet been reported.



Pressed Steel Carline.

PROPOSED EXTENSION OF DEMURRAGE AGREEMENTS.

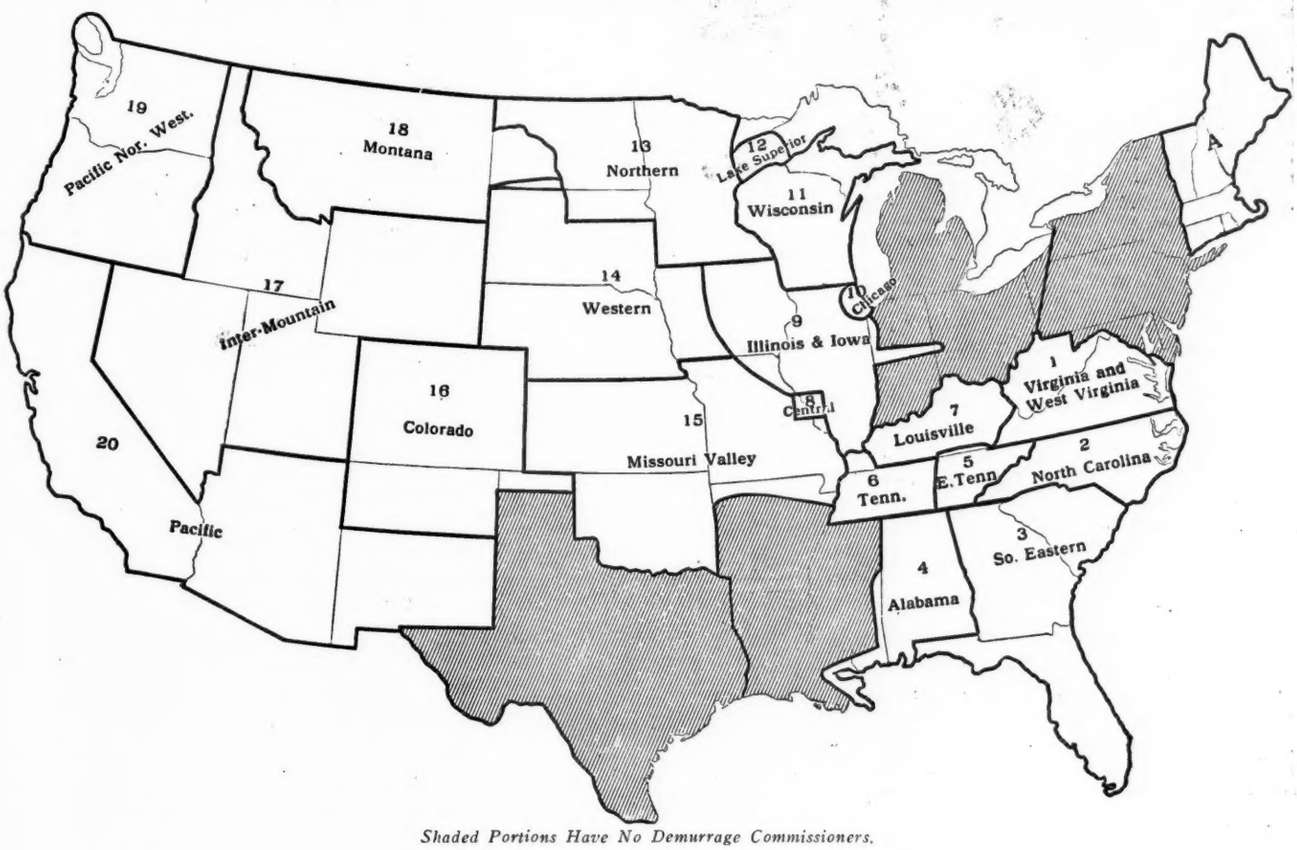
The American Railway Association, by letter ballot, the result of which was announced by Secretary W. F. Allen, August 11, has voted to authorize the supervision of freight car demurrage rules throughout the country by its Committee on Relations between Railroads, Arthur Hale, chairman. This committee, with the approval of the executive committee, will appoint district supervisors of demurrage, whose duty it will be to see that demurrage rules are administered on a uniform basis throughout their respective territories.

This proposed co-operative arrangement will be established on the basis of contracts between the companies. Each railroad joining will agree with all of the others, in the association for that district, to be governed by the rules, to furnish the necessary information and statistics, and to pay a proportion of the expense of supervision, on the basis of the number of cars handled in the territory supervised, this basis to be determined by the general secretary of the American Railway Association.

Excepting in New England demurrage is now managed throughout nearly the whole of the eastern and central states on an independent basis, each road for itself, all of the old demurrage associations having been disbanded; and even where associations now exist important roads stay out of them.

New England is under the supervision of a commissioner, Mr. Thomason, who is responsible jointly to the railroads and to the Interstate Commerce Commission, the commission being supposed to represent the shippers and consignees; but the cost of maintenance of the bureau is borne wholly by the railroad.

The other parts of the country which are under the supervision of joint commissioners, under the associations or bureaus established a number of years ago, are shown by the numbered sections in the accompanying map. Those parts of the map which are shaded represent areas now without supervision. The principal roads in the organized territory which have withdrawn from the demurrage associations are the Chicago &



Shaded Portions Have No Demurrage Commissioners.

Administration of Freight-Car Demurrage Rules.

Alton; Chicago & Eastern Illinois; Chicago, Indiana & Southern; Chicago, Terre Haute & Southeastern; Duluth, Missabe & Northern; Elgin, Joliet & Eastern; Illinois Central; Kansas City Southern; Minneapolis & St. Louis; Missouri, Kansas & Texas; St. Louis & San Francisco; St. Louis Southwestern; Toledo, St. Louis & Western; Vandalia.

The A. R. A. committee will endeavor to secure signatures to the proposed new contract in those territories which are not now organized.

DEAD LINE FOR STATION PLATFORM.

The photograph shows an effective method employed by the Chicago, Rock Island & Pacific at the Englewood station, Chicago, to warn passengers on the platform of the danger in standing too close to the track when trains are approaching the station. The platform is located at the end of a 3 deg. 30 min. curve which increases the danger both of being struck by the train and by coal falling from the tender of the locomotive, the latter being more frequent on account of the curvature of the track. As this station does a heavy business, both through and suburban, it was selected as the best location at which to give

Safety Sign and Line at Englewood Station, Chicago.

the method described a thorough trial. A white line, 7 in. wide, was painted on the brick platform 6 ft. from the nearest rail, and prominent signs were painted in large red letters on a white background reading "Danger—Keep Back of Line—Watch Your Children." These signs are hung from the under side of the roof of the umbrella shed, at intervals along the platform. So far this scheme has proven effective. These dead lines could be installed in the building of new platforms with white tile, brick or other material, depending on the character of the material, thus eliminating any maintenance cost.

New Bridge Over the Nile.—The bridge which has for many years carried the main line of the Egyptian State Railway over the Damietta branch of the Nile at Mansurah, a town in Lower Egypt about 84 miles down the river from Cairo, has recently been replaced by a structure more suitable for modern train loads. At this bridge the Nile has a mean width of 130 yds. in the low water season, and 240 yds. at flood season. The new bridge is composed of four spans, three of which are fixed and of uniform dimensions, while the fourth, the second from the Mansurah side, is of the movable swing type. The turning and wedging motions of the swing span are worked by hand.

General News.

The new all-steel ferry steamer *Edward T. Jeffery,* built for the Western Pacific, for service on San Francisco Bay and launched on July 19, is now in service between San Francisco and Oakland.

The Baltimore & Ohio, following conferences extending over several weeks, in regard to a number of complaints concerning working conditions in the shops, has come to a satisfactory agreement with the members of the machinists' union employed by the company.

The shops of the Trinity & Brazos Valley at Teague, Tex., including a number of cars and locomotives in the shops for repairs, were almost totally destroyed by a fire supposed to have started from an electric wire, on August 26. The loss is estimated at $225,000. It is announced that the shops will be rebuilt at once.

The North Western University School of Commerce, Chicago, has announced a course of thirty-two lectures on transportation to be given on Friday evenings from 7 to 9 o'clock, from October 1 to June 1. The course is designed to give the student a general knowledge of the transportation field as well as a detailed knowledge of the principal problems in transportation. The lectures will be given by Professor Secrist and will be grouped under the following heads: First semester, the American railway system, the railway service, the railroad and the public; and the railroad and regulation. The work of the second semester is primarily concerned with railway rates and regulation. The main topics considered are the theory of railroad rates, rate-making and practice, personal and local discriminations, freight classification, rate systems and the regulation of interstate commerce.

Charles S. Mellen, late president of the New York, New Haven & Hartford, has been retained by the directors in an advisory capacity for three years, at $30,000 a year. This statement is published on the authority of a member of the executive committee, who says that this action was taken in July, when Mr. Mellen's resignation as president was accepted. The directors felt that to keep Mr. Mellen within calling distance was only common prudence. As president, Mr. Mellen's salary was $60,000 a year until a few years ago, when it was reduced to $54,000 at the time that all of the executive officers voluntarily submitted to a reduction of 10 per cent. The report concerning Mr. Mellen's salary also has it that Mr. Tuttle, chairman of the board of directors of the Boston & Maine and formerly president of that road, had his salary of $30,000 continued during the year when, at the end of his term, he had leave of absence (1911) and that he now receives a comfortable salary as chairman; but that probably he will soon retire in favor of Mr. Elliott, the new head of the New Haven road. Mr. Mellen, while president of the Boston & Maine and the Maine Central, received no salary for his services in those positions.

Nothing New Under the Sun.

Sixty-two years ago, 1851, the Boston & Maine in its annual report said:

"The treasury of a railroad seems to be considered like a city carried by assault, the proper arena and admitted apology for plunder. It is perfectly understood among the profession, that the best feature in a lawsuit is to have a railroad company for an opponent. Judges and juries seem to vie with each other in heaping liabilities and imposing penalties upon them. Each succeeding legislature loads them with new restrictions, imposes new burdens and subjects them to new and unnecessary expenses, while the public are continually crying out for lower charges, greater speed and more frequent and more splendid accommodation. These are facts too notorious for denial, and it is the duty of those to whom the stockholders have intrusted their interest, to point out the dangers as well as the profits of their investments."—*Boston Journal of Education.*

Life on the Old B. & P.

Conductor H. E. Strout, of the New York, New Haven & Hartford, 73 years old, who has just been pensioned after 49 years of continuous service, gives the press agent of the road

some interesting reminiscences. He entered the service of the Boston & Providence in 1860, at the age of 20, as a brakeman, at seven dollars a week. In 1862, he enlisted in the Fourth Massachusetts Infantry, and served under General Banks in Louisiana. On July 14, 1863, he was wounded in the assault on Port Hudson, but completed his enlistment. He resumed his position with the road as brakeman in October, 1864, at $1.50 per day, later increased to $2. In March, 1871, he was promoted to the position of passenger conductor at a yearly salary of $1,000. At this time no money was deducted on account of sickness or absence from work, and no extra compensation was given for special trips.

"There were no local trains then out of or into Boston later than 6:30 p. m., with the exception of a theater train from Dedham, which ran once a week. The first Sunday train on the road, with the exception of the New York night mail train, was put on in July, 1871, and I was conductor of it for a number of years. There were no ticket offices open, even in Boston, for this train. We collected fares from every passenger and no rebates were given. Even the superintendent of the road was obliged to pay his fare. I collected about $100 to $150 each Sunday. There was no silver money at this time, it being all scrip, and this I carried between my fingers in order to make change rapidly. My regular run was three round trips daily between Boston and Dedham, 11 miles, stopping at all stations, leaving Boston at 8:30 a. m., 12:00 and 5:00 p. m., and returning from Dedham immediately upon arrival. On the morning and night trips we carried five or six cars, but on the noon trip only three.

"A few of the coaches held about 60 people, but not more than this number. There was no smoking car, but there was a 4-wheel baggage car. After much importunity on the part of the passengers, the company finally did take an old fish-car and fit it up with settees, and this was used for a smoking car. The cars were lighted by two kerosene lamps, one at each end of the car, with wicks about an inch in width; and at night conductors had to carry lanterns in collecting fares." For the past ten years Mr. Strout has been running the train leaving Boston at 3 p. m. for New York. He is a member of the G. A. R., the Order of Railroad Conductors, and Masonic bodies.

Applications for Engineering Positions with the Federal Railway Valuation Commission.

No work in recent years has attracted the attention of railway engineers to such an extent as has the valuation of railways being undertaken by the Interstate Commerce Commission, and for this reason positions with this commission have attracted far more than the usual number of applicants. Information regarding the examinations and the positions with their respective salaries was given in the *Railway Age Gazette* of June 20, page 1579. The number of applications received for the various positions with the salaries accompanying these positions is given below:

	No. of Applicants.	Salaries. Grade 1.	Grade 2.
Senior Structural Engineer	703	$3,000 to $4,800	$1,800 to $2,700
Structural Engineer	44	1,080 to 1,500	
Senior Civil Engineer	3,024	3,000 to 4,800	1,800 to 2,700
Civil Engineer	640	1,200 to 1,500	720 to 1,080
Senior Inspector of Car Equipment	262	1,800 to 3,600	
Inspector of Car Equipment	295	1,200 to 1,500	
Senior Electrical Engineer	488	3,000 to 4,800	1,800 to 2,700
Electrical Engineer	132	1,080 to 1,500	
Senior Inspector of Motive Power	475	1,800 to 3,600	
Inspector of Motive Power	271	1,200 to 1,500	
Senior Railway Signal Engineer	146	3,000 to 4,800	1,800 to 2,700
Railway Signal Engineer	50	1,080 to 1,500	
Senior Mechanical Engineer	425	3,000 to 4,800	1,800 to 2,700
Mechanical Engineer	63	1,080 to 1,500	
Senior Architect	239	3,000 to 4,800	1,080 to 1,500
Architect	11	1,080 to 1,500	

The fact that no examinations were required for positions paying over $1,800, doubtless had the effect of bringing out many applications from men who would not be sufficiently interested to take the examination at some central point. Likewise, undoubtedly many men made application for the positions paying $3,000 to $4,800, to whom only the highest positions would be an inducement.

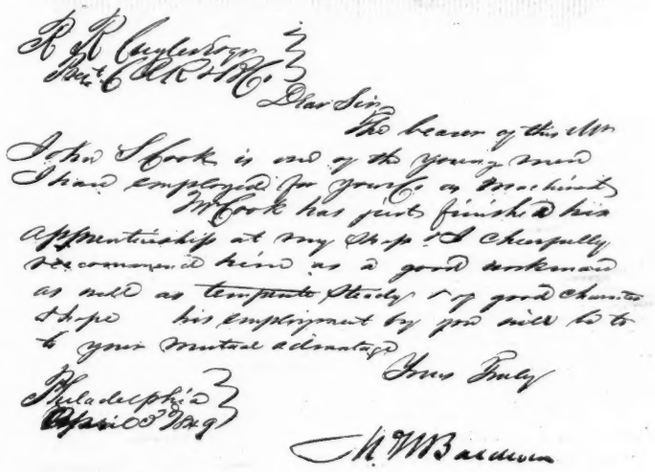
Melons by the Million.

Whoever thinks that the sailing ship is no longer an adjunct of Baltimore commerce will be informed of his mistake by paying a visit to municipal dock No. 5. During the current week this dock has been literally crowded with sloops, schooners and other sailing craft, all loaded to the gunwales with watermelons. There have been times during the week when there have been as many as 100 shiploads of watermelons at the dock at the same time. There have probably been more than 1,000 shiploads of watermelons delivered to Baltimore from along the two shores of the Chesapeake since the beginning of August.

Some of these vessels are equipped with gasoline engines, but most are sailboats. After the trucking season is over this fleet will go into the oyster business. Wheat and corn are brought to Baltimore on sailboats, just as they were a hundred years ago. During the past 10 days trainloads of watermelons have been shipped out daily to the mining regions of Pennsylvania and to northern cities.—*Baltimore Star.*

A Letter of M. W. Baldwin.

The letter dated April 3, 1849, a fac-simile of which is shown below, was written by M. W. Baldwin of Philadelphia, the father of the Baldwin Locomotive Works. It is of interest, not alone because of the distinguished name attached to it, but also from the fact that John S. Cook, the man in whose favor it was written, was in active railroad service for about 64



years, and until a few weeks ago. The death of Mr. Cook is announced in another column of this paper.

In a letter to a friend in Philadelphia, written nine years ago, Mr. Cook explained that the reason the Baldwin letter had remained in his possession, was that one other man of a party of five presented his letter to the prospective employer and that that one had answered for the whole party. The party consisted of J. Robinson, J. R. Seeley, David Hennessey, P. Rice, and Mr. Cook. Mr. Cook said that the Baldwin letter, except for the signature, was written by George Burnham, Senior.

Disastrous Collision at North Haven, Conn.

In a rear collision of passenger trains on the New York, New Haven & Hartford, two miles north of North Haven, Conn., on the morning of the second of September, 23 passengers were killed and 30 or more injured, three sleeping cars being wrecked. The collision occurred in a dense fog about 6:55 a. m. The cause seems to have been the failure of an engineman to run under proper control approaching a stop signal in a fog.

Both trains were filled with passengers returning from New England summer resorts, the leading train having ten sleeping cars and the following train five, all Pullman cars; and all of the cars were wooden.

The line at the point of collision, which is about nine miles north of New Haven, is straight and the grade is slightly descending. Southbound train No. 91, the Bar Harbor Express,

second section, was stopped at automatic block signal No. 23, because of the presence of a local passenger train in the section ahead. Having made a full stop the engineman started forward; then, as soon as the whole train had passed beyond the signal and into the next block, the conductor signaled the engineman to stop, or slacken, in order to enable the rear flagman, who had gone back, to regain the train. The collision occurred, however, before he had reached the last car. When some distance away he heard the following train approaching and at once started back a second time. The length of time consumed in the stop at signal 23, and of the stop after passing it; and also the distance which the flagman had gone back, are elements in the situation, concerning which, as yet, the testimony is not clear.

The second train was the first section of No. 95, the White Mountain Express. It had passed Wallingford, the last station preceding, about eight minutes behind the second section of No. 91. Engineman Miller, of the White Mountain train, says that on approaching signal No. 23 he shut off steam about a mile back; but it appears that he was running about 40 miles an hour when he came in sight of the preceding train, which was moving very slowly forward. Miller applied the brakes and he slackened the speed somewhat before striking the train ahead. His engine, a new one, weighing about 125 tons, completely demolished the two rear cars and lifted up and overturned the third car from the rear; and did some damage to the fourth. Few, if any, passengers were injured ahead of the fourth car, and none were seriously injured in the second train.

The signals on this part of the road are enclosed disks, installed by the railroad company, about 25 years ago. When originally installed there were no distant signals and no overlaps; and so far as can be learned, from the testimony thus far available, there was no distant indication on the day of the collision. It seems to be admitted that the engineman received a clear signal indication at the last signal before reaching signal No. 23; and the fact that the preceding train had cleared No. 23 only about 100 ft. or less, seems to indicate that there was no overlap.

Engineman Miller's testimony, so far as it can be made out, is to the effect that he saw signal 23, saw the rear end of the preceding train, and encountered the torpedoes of the flagman, all at about the same time.

Engineman Miller has been in the service of the road since 1899 and an engineman since 1903; and this was his regular train.

The transcript of the engineman's time previous to the accident is as follows:

"Engineer Miller ran No. 96 on Saturday, August 30, arrived Springfield and released from duty 12:55 a. m. Sunday, August 31.

"Had twenty-eight hours and twenty-seven minutes to rest—Sunday layover.

"September 1 called at Springfield 5:22 a. m. to run No. 95 to Stamford. Left Springfield 6:12 a. m. Arrived Stamford 9:27. Put engine away 9:42 a. m. Total time on duty, four hours and twenty minutes.

"Rest period at Stamford, 11 hours 38 minutes.

"September 1—Called Stamford 9:20 p. m. for 2-96 and arrived Springfield 1:17 a. m. Put engine away and released 1:37 a. m. Total time on duty, 4 hours 17 minutes.

"Rest period at Springfield, 3 hours 6 minutes.

"September 2—Called Springfield 4:43 a. m. for 1-95. Wreck occurred North Haven 6:55 a. m., after he had been on duty 2 hours 12 minutes.

"Above show total 10 hours 49 minutes worked from 12:55 a. m. August 31, until 6:55 a. m. September 2, 1913."

A preliminary statement issued by the road contains the following:

"Flagman Murray says that he went back promptly with proper signals and was recalled by the engine whistle. In the meantime his train had started and was stopped by Conductor Adams to wait for him after the rear end had cleared signal 23. Before he reached the rear of his train he heard the following train approaching. He stopped, started back and was 450 ft. from the rear of his train and about 400 ft. from signal 23 when first 95 passed him. He states that he placed two torpedoes on the rail approximately six telegraph poles from the rear of his train.

"Conductor Bruce C. Adams, in charge of second 91, states that he left Springfield 1 hour and 13 minutes late. He lost between Springfield and the point of the accident on the running time of this train fifteen minutes on account of running slow in the fog. When the train stopped on account of signal 23, he immediately got off, saw his flagman start back, and as soon as the brakes were released the train started. He estimates that approximately two minutes elapsed from the time that the train first stopped until it started, and approximately two to four minutes at the second stop before the collision occurred. Conductor Adams is 35 years old, and has been for nineteen years in service as freight brakeman, flagman and conductor, about one year as conductor on passenger trains."

Fourteen Passengers Killed on the Midland Railway of England.

In a rear collision of passenger trains on the Midland Railway, near Hawes Junction, in the north of England, September 2, fourteen passengers and an engine driver were killed and 30 passengers were injured. Several coaches were demolished and the wreck quickly burst into flames. Many of the passengers were burned, and it was believed that many of the injured persons taken out of the wreck had sustained fatal injuries by the flames. The trains were southbound, the first and second sections of the Scotch express for London. They left Carlisle about 2 a. m., and the collision occurred before daylight. The first section had been stopped at the foot of a grade.

Co-operation to Prevent Car Shortage.

W. A. Garrett, vice-president of the Chicago Great Western, has issued a circular to agents, yardmen, trainmen and shippers and receivers of freight, urging co-operation to increase car efficiency, as follows:

"We are confronted with a car shortage, and the consequent loss of revenue can only be prevented by co-operation.

"Agents can help by giving immediate notice of arrival to consignee in accordance with the tariff and impressing on patrons the necessity of promptly releasing cars; by promptly placing all cars on which disposition is furnished; by having necessary repairs made at once to defective cars and promptly ordering material needed for this purpose; by promptly unloading company material; by prompt handling of refused shipments; by not ordering more cars than can be loaded promptly; by avoiding the light loading of merchandise cars; by the substitution, as far as practicable, of one class of equipment which is plentiful for another class which is short; by seeing that loaded cars are billed and moved promptly; by keeping chief despatcher informed as to delayed loads and empties.

"Trainmen and yardmen can help by spotting cars promptly for loading and unloading; by reporting, switching and moving empties not needed for immediate loading; by looking out for defects and giving prompt notice of repairs needed, especially calling attention to repairs which may require transfer of lading; by consolidating light merchandise cars; by seeing that cars are moved without delay.

"Shippers can help by making requests for cars in writing and giving as much advance notice as possible; by not ordering more cars than needed for immediate loading; by not taking advantage of the full free time allowed for loading and by giving immediate notice when car is loaded; by loading cars promptly and to full capacity, which is 10 per cent. above marked capacity, and by seeing that sufficient products are on hand to load cars to capacity; by avoiding the use of cars for storage while waiting for deliveries to complete carloads.

"Everybody can help by giving cars preferred attention at all times."

American Society of Civil Engineers.

The first regular business meeting of the American Society of Civil Engineers for the season of 1913-14 will be held September 3. Two papers will be presented for discussion, as follows: The Storage of Flood-Waters for Irrigation: A Study of the Supply Available from Southern California Streams, by A. M. Strong, Assoc. M. Am. Soc. C. E.; and Modern Pier Construction in New York Harbor, by Charles W. Staniford, M. Am. Soc. C. E. These papers were published in the May, 1913, *Pro-*

ceedings. A discussion on Mr. Strong's paper, by Charles H. Lee, Assoc. M. Am. Soc. C. E., and discussions on Mr. Staniford's paper by Messrs. E. G. Walker, Edwin J. Beugler, and Harrison S. Taft, will be presented.

American Railway Safety Association.

A meeting of the American Railway Safety Association to perfect its organization will be held at the Hotel La Salle, Chicago, at 1 p. m. on September 22. A. W. Smallen, chairman of the general safety committee of the Chicago, Milwaukee & St. Paul, who was elected temporary chairman of the association at a preliminary meeting several months ago, expects representatives of at least fifty railways to attend the meeting.

Canadian Railway Club.

At the next meeting of the Canadian Railway Club, to be held September 9, a paper will be presented by A. Crumpton, assistant engineer, Grand Trunk Railway, entitled Railway Efficiency. There will also be an election of members to fill the places made vacant by the resignation of C. Murphy and D. Crombie, from the executive committee.

New York Railroad Club.

At the next regular meeting of the New York Railroad Club, to be held September 19, William Walter Wheatley will present a paper on Railway Economy Versus Political Economy.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 19, 1914, St. Louis.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York. Annual meeting, October 14-15, Philadelphia, Pa.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Thursday and Friday in May.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—H. G. McConnaughy, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, November 19, 1913, Chicago.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-24, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wenlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Annual convention, October 18-24, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual convention, May 18-22, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio.

MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3rd Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY FIRE PROTECTION ASSOCIATION.—C. B. Edwards, Mobile & Ohio, Mobile, Ala. Next meeting, October 7, Chicago.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. & TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Sups.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meeting with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago. Annual meeting, September 23-25, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Maekie, 7122 Stewart Ave., Chicago.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.

UTAH SOCIETY OF ENGINEERS.—Fred D. Ulmer, Oregon Short Line, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The Great Northern and the Northern Pacific have announced that all passes issued to Montana state officers and their deputies have been revoked.

The Illinois Traction System, operating 500 miles of interurban trolley lines in Illinois, has been admitted to membership in the Illinois Freight Association, and will become a party to joint tariffs filed by the association on the same terms as steam railways.

Attorney-General Smith of Minnesota has given an opinion that those who actually paid the freight are entitled to refunds under the decision of the United States Supreme Court in the Minnesota rate case. The opinion was given as the result of petitions that farmers be given the refund on grain shipments; but the attorney-general holds that the freight was actually paid by elevator men or buyers.

The Union Pacific reports that during July the "Denver Special" train No. 11 from Chicago to Denver over the Chicago & North Western and the U. P., arrived at Denver on time thirty times, although the schedule is fast and the distance is more than 1,000 miles; and we are informed that the corresponding train of a competing line, which nearest approached this record, arrived at Denver three times late during the same period. The "Colorado Express" No. 15, from Chicago to Denver, arrived at Denver on time 28 days during the same month.

The Trunk Line railroads expect to file their new freight tariffs, making increases of 5 per cent. in rates generally, on or about October 1, so that if the Interstate Commerce Commission should not suspend the tariffs the advances would go into effect about November 1. The Pennsylvania Railroad has notified the Public Service Commission of the State of Pennsylvania that if and whenever the interstate rates are changed, a change will also have to be made in the rates within the State of Pennsylvania; this in order to maintain the parity now existing as between different commercial communities.

During the colonist fare period, September 25 to October 10, the Union Pacific will again run through colonist special trains, consisting entirely of tourist sleeping cars, from Omaha to San Francisco, on a fast and convenient schedule. These trains will leave Omaha September 26-27-28, and October 9-10-11, six in all. Through tourist sleepers will be carried from Chicago and Omaha to San Francisco, also to Los Angeles via both the Southern Pacific and the San Pedro, Los Angeles & Salt Lake. These special trains have attained popularity since their inauguration by the Union Pacific two years ago, on account of the quick schedule, with convenient connections at Omaha and arriving time in California.

Assistant Attorney-General Fitch of Missouri has announced that a suit will be instituted shortly in the state supreme court to recover from the railways the excess of freight and passenger rates above the rates fixed by law collected by railways in Missouri, while the state rate law was pending in the federal courts, dating from March, 1909. The amount to be refunded has been variously estimated by state officers at from $10,000,000 to $20,000,000. The plan is to sue the railroads on behalf of the people of the state and then to make refunds to those who can furnish legal proof of payment of the higher rates. Mr. Fitch has also served notice on the railways that the excess baggage law permits a charge for extra baggage of only 12½ per cent. of the amount of the fare, and that the railways must cease charging 16⅔ per cent., or a suit will be instituted. He has also announced that an appeal will be made by the Public Service Commission of Missouri to the Interstate Commerce Commission complaining that the railways are discriminating by charging for interstate transportation more than the maximum fare of either of the two states involved. The Wabash, the Missouri Pacific and the St. Louis & San Francisco on August 29 filed new tariffs reducing their excess baggage rate to 12½ per cent. of the passenger fare.

St. Louis Shippers Want Cars Pooled.

P. W. Coyle, traffic commissioner of the Business Men's League of St. Louis, expresses the position of the League with reference to the car situation as follows in *Forward St. Louis,* a paper published by the League:

"It is quite apparent that a scarcity of freight cars, and a possible congestion, such as existed in 1907, confronts us. Obviously, it is to the best interests of all concerned that all cars should be loaded and unloaded as promptly as possible, and that every car should be loaded to its maximum capacity. We respectfully urge the shippers to take such action.

"In doing this, however, we wish to direct attention to the fact that we are urging the carriers to so arrange their method of interchange of freight cars, that the shippers may be privileged to use cars owned by the different railroads more indiscriminately, or in other words, that the freight cars of the country should be pooled for more economic use. We believe shippers should contend for this "single unit," or that carriers should permit shippers to load cars, irrespective of their ownership, if the size and character are such as to conform to the order of the shipper.

"There are in use today, approximately, 2,500,000 freight cars, which, we believe, if properly distributed, interchanged on an economical basis, handled more expeditiously through terminals, etc., and loaded and unloaded more promptly by the shippers, would make available sufficient equipment to avoid this shortage and congestion.

"Under the present methods, however, each railroad may, at its option, call in its surplus cars from foreign lines, and restrict their use to its own rails, so that the circulation of freight cars may be said to resemble the currency of the country. The railroad manager scenting a boom in business, calls in his cars and holds them to protect his individual interests, just as the banker scenting a panic calls in his surplus, thus limiting the supply when general circulation is most needed.

"As a practical illustration of another feature, a St. Louis shipper may have an order for one or more carloads, say for Columbus, Ohio, requiring Big Four delivery, and he may have upon the track at his industry one or more Pennsylvania cars of required capacity, etc. In order, however, to comply with the requirements of consignee and conditions at destination, these Pennsylvania cars must be pulled out and New York Central cars placed instead. Multiply this by the thousands of similar cases throughout the country and the inefficiency of the present method is so apparent that 'he who runs may read.'"

Shippers Fined for Defrauding Railways.

Fines totaling $11,000 were recently imposed on and paid by Harry C. Shimer and Adolph Fortgang, of the firm of R. B. Shimer & Co., New York, who pleaded guilty to certain counts in indictments brought against them in the United States District Court, Southern district of New York, for bribing railroad employees to furnish names of consignors shipping to other consignees and for obtaining payment from the railroads of false claims for loss and damage on shipments of eggs. In passing sentence the court, in part, stated as follows:

"Mr. Shimer and Mr. Fortgang, if I should actually do what I ought to do in this case, in order thoroughly to vindicate the law and make an example for others, one which would have a salutary effect in deterring others from committing this and like offences, I would fine you enough to take from you and this firm every cent of your ill-gotten gains, and then, in addition to that fine, add a long term of imprisonment; and in this way all who are disposed to indulge in grossly illegal practices to enrich themselves at the expense of others would be taught a lesson—the existence of the law and that punishment is sure to follow.

"This is a serious offence. In many of its aspects it is worse than larceny, because it was obtaining the money of others by fraud and deceit to enrich yourselves. When a criminal goes out with a gun and says to a man, in the darkness of the night, 'Hold up your hands; stand and deliver,' there is an element of manliness and bravery about it which is entitled to more respect than the getting of money in the ways resorted to by you in this case. I trust you feel the sting of this; you ought to; and your offence and punishment will go out to the community, and will become known, and you will consider the publicity as a part of your punishment, and as something that will operate to deter others.

"And now I want to say to you that in foregoing the addition

of imprisonment, and imposing so light a fine in view of the amount you made by your doings, after all the ends of justice will probably be served and the dignity of the law upheld, but I want to say to you further, and to each of you, that so far as is within my power I will see, and I know that the United States attorney and his able assistants will see, and that the United States attorneys wherever they are and wherever an offence might be indictable, will see—and this is a warning and not a threat—that if you should offend against the law again in these respects, you need not expect to escape with a fine, for surely the penalty will be not only a heavy fine, but a long term of imprisonment, justly earned by a repetition of such an offence as this."

INTERSTATE COMMERCE COMMISSION.

Oyster Shipments from Baltimore.

Atlantic Packing Company of Baltimore City et al. v. American Express Company et al. Opinion by Commissioner Marble:

In this case the complainants asked the commission to require the respondent express companies to perform pick-up service for express shipments of oysters at Baltimore. They also asked reparation. The express companies now maintain receiving stations at various points in Baltimore, to which oysters are brought by shippers, and from which they are taken to the loading platforms by the express companies. Only one-third of the oyster shippers in Baltimore prefer a pick-up service to the present method. The commission found that in other cities this pick-up service was supplied, but under conditions dissimilar to those at Baltimore. The commission decided that the tariffs of the respondents should be changed so that they would plainly state the extent as to territory and commodities of the pick-up and delivery service at Baltimore; also that there is no undue discrimination in the present Baltimore arrangement of receiving oyster shipments, but that new receiving stations should be built at points which would be easily accessible to the complainants. Reparation was denied. (28 I. C. C., 244.)

Rates on Wooden Lard Tubs Reduced.

Southwestern Woodenware Company v. Chicago, Milwaukee & Puget Sound et al. Opinion by the commission:

On January 26, 1911, the defendants reduced rates on wooden lard tubs, in carloads from Tacoma, Wash., to Chicago and other eastern points, but raised the minimum to 41,500 lbs., regardless of the length of the car. The lower rates and higher minimum were suspended on April 22, 1911, and the higher rates and lower minimum weight were continued in the tariffs. The complainant contends that the higher rates are unreasonable in themselves and that the minimum of 41,500 lbs. applicable to shipments under the reduced rates is unreasonable because, except in rare instances, the traffic cannot be loaded to that weight. The complainant asks that the carrier be required to apply a minimum weight of 34,000 lbs. to the lower rate or to restore to the tariff, naming the lower rate and higher minimum, the two-for-one rule. The commission decided that the higher rates were unjust and unreasonable and that the minimum rate of 41,500 lbs. in connection with which the lower rates are applied is also unreasonable. The commission prescribed lower rates for the future and decided that 31,500 lbs. was a reasonable minimum weight for the traffic for cars 41 ft. long, and correspondingly lower or higher for cars under or over that length. Reparation was denied. (28 I. C. C., 237.)

STATE COMMISSIONS.

J. L. Harrop has been appointed chief engineer of the Missouri Public Service Commission with charge of grade crossing elimination.

Petitions for additions and changes in the Illinois commissioners' classification of freight will be considered at a meeting of the Illinois Railroad and Warehouse Commission, to be held in Chicago on September 10.

The Pennsylvania Public Service Commission has recommended that as the steps or sideboards on some of the open street cars operated by the Wilkesbarre Railway Company are too high, the company shall erect platforms at the regular stops; and for other places must provide step boxes where necessary.

The Kansas Public Utilities Commission has filed a complaint with the Interstate Commerce Commission against sixty-seven railways, charging discrimination in freight rates on a large number of commodities from Galveston and New Orleans in favor of Kansas City and Omaha as against Kansas communities.

The Wells Fargo & Company's Express has made application to the California State Railroad Commission for rehearing on its recent order reducing express rates. The Southern Pacific has also filed a petition for a rehearing of the case, stating that the Southern Pacific is not a principal stockholder of Wells, Fargo & Co., but on the contrary does not own any stock in the express company.

The Kansas City Board of Trade on August 26 filed with the Missouri Public Service Commission a complaint charging that several railways are violating the maximum freight law by charging higher than the legal rates on grain reconsigned at Kansas City. The commission issued an order calling upon the roads to show cause why they should not be enjoined from charging higher rates on reconsigned grain.

COURT NEWS.

The attorney-general has begun suit in the district court at Philadelphia to annul the control of the Philadelphia & Reading over the Central of New Jersey, attacking the present relations of the companies under the anti-trust law, and also under the commodities clause of the Interstate Commerce law. It will be recalled that in the decision of the Supreme Court, in the anthracite coal cases, a few months ago, the relations of the Reading with the Central of New Jersey were not passed upon; that part of the subject was dismissed without prejudice. The questions left unsettled at that time are the basis of the present suit.

RAILWAY DEVELOPMENT IN GREECE.—Discussing the reception of King Constantine in the capital the Athens newspapers say that, after the impending demobilization, the country must work at the organization of a settled administration and the development of Greece's new territories. Apart from joining up Greek railways with the European lines, the Greek system must be extended throughout the kingdom.

LIGHT RAILWAYS IN JAPAN.—The British vice-consul at Yokohama reports that numerous light railways have been constructed during the last few years, and there are now within the consular district of Yokohama no less than 271 miles of light railways, while another 238 miles are either under construction or consideration. So far, he adds, nothing further has been heard regarding the scheme for converting the Tokaido railway track into a standard gage system, which was first mooted several years ago, but subsequently abandoned owing to the enormous outlay it would involve.

BURMA RAILWAYS.—The Burma Railways Company, Ltd., is hampered by the action of the railroad board, which reflects the attitude of the government of India. The railway board is alternately accused of extravagance and of parsimonious neglect, but the former is neither required nor desired in the case of Burma. The traffic returns of the Burma Railways last year bear eloquent and conclusive testimony to the advantages of a forward policy of railroad building. The number of passengers carried on the main line and the Pegu-Moulmein and Henzada-Kyaungin extensions was 23,966,266, an increase of over 2,000,000 as compared with the previous year. Both on the main line and on the extensions the percentage of expenses to earnings fell, and the percentage of earnings to capital outlay everywhere increased. Figures like these are very satisfactory in themselves and amply warrant the belief that if further extensions were undertaken—and especially if the construction of the through connection to China were placed in the hands of the Burma Railways Company—the financial and commercial benefit to Burma would be large.

REVENUES AND EXPENSES OF RAILWAYS.

Month of June, 1913.

Name of road.	Average mileage operated during period.	Operating revenues: Freight.	Passenger.	Total. inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Atlanta, Birmingham & Atlantic	645	$160,923	$52,082	$232,584	$42,868	$43,308	$15,240	$104,640	$10,604	$216,660	$15,924	.....	$14,337	$1,587	$7,253
Atlantic City	167	70,471	166,883	247,510	41,590	17,836	3,485	104,873	1,214	168,998	78,512	$572	11,703	67,381	27,988
Atlantic & St. Lawrence	167	87,558	45,886	137,468	23,412	22,654	4,188	59,912	4,990	115,156	22,312	.....	18,804	3,508	29,540
Bangor & Aroostook	631	199,728	56,702	273,157	11,242	26,677	2,393	74,793	15,354	130,459	142,698	—622	2,473	144,549	114,948
Boston & Maine	2,252	2,307,631	1,373,633	4,048,655	150,253	632,005	70,396	1,792,995	236,524	2,882,173	1,166,482	22,753	68,688	1,120,547	345,619
Butte, Anaconda & Pacific	90	88,053	12,966	111,019	—5,372	24,768	646	45,776	4,064	69,882	41,137	.....	2,000	39,137	34,959
Central of Georgia	1,924	512,497	299,293	896,420	120,378	194,777	35,603	381,191	35,720	767,669	128,751	7,219	44,927	91,043	—77,993
Central of New Jersey	676	2,262,861	487,006	2,407,234	327,405	344,562	39,302	715,200	63,194	1,489,663	917,571	7,051	283,947	640,675	—247,228
Central New England	277	252,002	30,298	297,326	66,474	26,312	1,805	71,983	7,975	174,549	122,777	263	14,514	108,526	—28,940
Chicago & Eastern Illinois	1,275	1,003,158	251,633	1,345,482	211,488	244,754	18,156	454,288	37,090	965,776	379,706	—1,110	43,466	335,130	—77,605
Chicago Great Western	1,496	849,602	284,319	1,224,843	181,291	176,695	49,708	438,102	35,040	880,836	344,007	639	46,661	297,985	93,438
Chicago, Indianapolis & Louisville	617	371,960	138,271	562,638	94,399	85,902	18,427	223,549	17,954	440,231	122,407	.....	28,578	93,829	603
Chicago, Peoria & St. Louis	255	94,961	27,469	129,811	24,546	28,606	6,627	59,145	4,858	123,782	6,029	.....	4,765	1,264	115
Detroit, Grand Haven & Milwaukee	191	147,354	63,565	235,875	35,180	36,898	7,510	113,019	10,908	203,515	32,360	—135	11,244	20,981	623
Georgia	307	133,264	71,851	221,804	32,042	50,126	11,243	124,032	8,522	225,965	—4,161	.....	2,950	—7,111	—41,063
Georgia Southern & Florida	395	106,087	61,500	194,426	25,956	18,765	8,402	84,794	9,461	147,378	47,048	.....	10,660	36,368	8,245
Grand Trunk Western	347	424,752	220,734	681,356	86,595	101,459	23,672	302,498	22,118	536,342	145,014	—1,653	49,776	93,585	25,902
Houston, East & West Texas	191	82,033	33,119	122,648	38,150	9,975	2,582	39,750	4,224	94,681	27,967	.....	2,978	24,989	22,242
Houston & Texas Central	789	287,275	153,034	477,637	105,439	77,233	26,281	234,603	17,798	461,354	16,283	—210	18,208	—2,135	—40,343
Louisville & Nashville	4,923	3,285,980	1,095,883	4,668,023	1,269,009	713,332	105,930	1,714,073	155,352	3,957,696	710,327	8,745	46,968	672,104	—125,873
New York, New Haven & Hartford	2,090	2,317,229	2,483,035	5,415,751	594,131	818,584	206,952	1,614,232	150,507	3,384,406	2,031,345	—29,263	196,756	1,805,326	—236,881
Philadelphia & Reading	1,015	3,241,371	664,159	4,027,832	487,717	632,962	41,115	1,308,103	61,462	2,531,359	1,496,473	39,497	351,029	1,184,941	—18,717
Port Reading	21	123,913	.....	128,062	15,681	13	30	30,942	90	46,756	81,306	7,092	33,497	54,901	15,460
St. Louis Southwestern of Texas	703	217,188	87,804	330,776	66,284	86,951	12,729	178,235	18,929	363,128	—32,352	—306	11,229	—43,887	—76,009
Southern Pacific Co	6,329	4,578,198	2,749,243	7,960,974	763,312	1,124,910	168,764	2,195,975	226,935	4,479,896	3,481,078	—2,375	343,283	3,135,420	486,847
Texas & Pacific	1,885	758,532	364,692	1,203,513	197,104	238,305	45,657	637,561	54,766	1,173,393	30,120	—11,705	102,785	—84,370	68,205
Union Pacific	3,581	2,819,169	937,407	4,198,488	407,751	499,325	142,424	1,064,447	133,861	2,247,808	1,950,680	6,159	138,242	1,818,597	485,583
Western Pacific	937	365,158	131,837	512,861	84,135	27,684	34,614	179,192	26,230	351,855	161,006	—1,444	26,189	133,373	34,133

Twelve Months of Fiscal Year, 1913.

Name of road.	Average mileage operated during period.	Operating revenues: Freight.	Passenger.	Total. inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Atlanta, Birmingham & Atlantic	645	$2,358,795	$654,988	$3,243,045	$529,743	$522,252	$183,404	$1,305,446	$135,899	$2,676,744	$566,301	.....	$164,235	$402,066	—$101,259
Atlantic & St. Lawrence	167	1,242,448	358,464	1,739,091	305,321	260,287	53,479	902,385	47,228	1,568,700	170,391	.....	152,286	18,105	43,357
Atlantic City	167	769,108	1,317,384	2,205,125	388,851	180,794	32,944	1,115,924	15,937	1,734,450	470,675	—$35,385	110,702	324,588	—55,137
Bangor & Aroostook	631	2,452,468	626,929	3,255,936	493,449	413,676	37,386	1,117,522	157,063	2,219,096	1,036,840	—1,951	110,587	924,302	—149,422
Boston & Maine	2,252	28,692,689	16,049,174	48,513,507	5,424,104	7,769,904	454,537	23,092,966	1,359,914	38,101,425	10,412,082	187,914	2,025,629	8,574,367	—385,260
Butte, Anaconda & Pacific	90	1,079,014	133,438	1,330,940	133,891	265,193	8,449	631,110	36,532	1,075,175	255,765	.....	24,638	231,127	49,506
Central of Georgia	1,924	8,803,118	3,828,199	13,854,872	2,020,950	2,577,255	421,029	4,837,723	468,007	10,324,964	3,529,908	73,483	598,538	3,004,853	—447,124
Central of New Jersey	676	21,903,446	5,508,425	28,405,757	2,785,817	4,220,747	360,570	8,499,555	538,172	16,404,861	12,000,896	—65,611	1,521,495	10,413,790	1,367,408
Central New England	277	3,166,658	360,203	3,708,971	558,157	350,958	14,786	994,770	46,572	1,965,243	1,743,728	—4,386	124,514	1,614,828	35,491
Chicago & Eastern Illinois	1,275	11,984,134	2,950,221	16,214,972	2,155,196	3,717,829	316,582	6,205,411	489,650	12,884,668	3,330,304	—25,571	611,844	2,692,889	—1,164,869
Chicago Great Western	1,496	9,795,074	3,144,284	14,000,618	1,688,800	2,067,288	565,649	5,524,434	413,971	10,260,142	3,740,476	2,293	439,419	3,303,350	922,821
Chicago, Indianapolis & Louisville	617	4,682,585	1,648,884	6,985,944	1,069,198	982,051	216,675	2,656,418	179,595	5,103,937	1,882,007	.....	294,039	1,587,968	137,672
Chicago, Peoria & St. Louis†	255	581,230	141,632	767,378	118,430	158,160	41,411	388,112	35,836	741,949	25,429	.....	26,605	—1,176	—12,939
Detroit, Grand Haven & Milwaukee	191	1,530,351	649,349	2,516,327	551,426	364,853	82,102	1,341,492	65,585	2,405,458	110,869	—644	43,727	66,498	—240,620
Georgia	307	2,014,097	882,165	3,117,766	356,275	598,668	138,247	1,567,372	99,342	2,759,904	357,862	.....	35,728	322,134	—441,361
Georgia Southern & Florida	395	1,410,480	830,541	2,566,890	313,480	465,904	94,638	1,052,672	112,444	2,039,138	527,752	—339	132,838	394,575	—28,535
Grand Trunk Western	347	4,777,592	2,238,742	7,476,500	826,430	1,077,613	262,814	3,295,827	194,397	5,657,081	1,819,419	—22,098	378,425	1,418,896	—471
Houston, East & West Texas	191	963,311	361,160	1,403,271	336,042	172,826	25,813	478,460	46,291	1,059,432	343,839	.....	42,883	300,956	—11,251
Houston & Texas Central	789	4,472,254	1,893,541	6,828,648	1,059,667	1,162,530	220,748	2,835,590	204,594	5,483,129	1,345,519	—11,182	231,516	1,102,821	442,487
Louisville & Nashville	4,923	42,924,952	12,835,658	59,465,699	11,033,134	11,216,889	1,259,702	19,884,015	1,417,140	44,810,880	14,654,819	20,428	1,761,626	12,913,621	—1,808,977
New York, New Haven & Hartford	2,090	34,071,975	27,896,300	68,613,503	7,893,090	9,600,669	582,310	27,203,271	1,947,999	47,227,339	21,386,164	645,447	3,714,756	18,316,855	—2,107,475
Philadelphia & Reading	1,015	41,033,465	7,101,752	50,562,717	4,687,899	8,432,953	492,482	16,199,894	734,113	30,547,341	20,015,376	411,432	1,300,478	19,126,330	3,918,517
Port Reading	21	1,568,141	.....	1,606,037	132,070	3,210	366	423,397	1,669	560,712	1,045,325	82,497	121,497	1,006,325	224,880
St. Louis Southwestern of Texas	703	3,270,929	1,109,003	4,700,840	984,258	966,397	159,070	1,987,455	237,046	4,334,226	366,614	—2,301	131,077	233,236	—135,382
Southern Pacific Co	6,329	56,399,970	32,028,818	95,335,315	10,151,846	13,163,050	2,062,543	26,697,435	2,596,620	54,671,494	40,663,821	1,502,186	4,379,326	37,786,681	3,297,086
Texas & Pacific	1,885	12,407,401	4,513,962	18,078,783	2,376,174	2,978,754	420,759	8,434,431	562,662	14,772,780	3,306,003	—29,167	693,442	2,583,394	—305,228
Union Pacific	3,581	36,230,966	10,529,587	51,586,230	5,667,120	6,219,644	1,175,839	13,951,142	1,400,881	28,414,626	23,171,604	—41,331	2,036,285	21,093,988	3,299,884
Western Pacific	937	4,635,631	1,354,083	6,173,628	938,612	517,849	359,523	2,369,411	315,094	4,500,489	1,673,139	—11,635	278,096	1,383,408	576,135

† Figures shown here are for period January 1 to June 30.

Railway Officers.

Executive, Financial and Legal Officers.

R. J. McCarty, vice-president and auditor of the Kansas City Southern, at Kansas City, Mo., has been appointed vice-president in charge of accounts, and his former position has been abolished. L. J. Hensley, assistant auditor, has been appointed auditor. P. E. Wooley, freight and passenger accountant, succeeds Mr. Hensley, and G. H. Bacon succeeds Mr. Wooley, all with headquarters at Kansas City, Mo.

A. H. Smith, senior vice-president of the New York Central & Hudson River, announces that Howard M. Biscoe has been appointed vice-president in charge of the Boston & Albany, with headquarters at Boston, Mass., succeeding J. H. Hustis, who recently resigned to go to the New York, New Haven & Hartford. Mr. Biscoe for the last two years had been traffic manager of the B. & A. He was born on July 3, 1869, at Westboro, Mass., and was graduated from Yale University in 1892. He began railway work the same year in the ticket auditor's office of the Boston & Albany. In 1893 he went to the Central Vermont, where he had a position in the general freight office. He remained in that position until March, 1896, when he went back to the Boston & Albany and was appointed clerk in the general traffic manager's office. From April, 1898, to May, 1905, Mr. Biscoe was foreign freight agent of the same company at Boston; following which he was appointed general freight agent. From February 15, 1910, to June 3, 1911, he was assistant freight traffic manager, and since that time, as above stated, has been traffic manager of the same road.

H. M. Biscoe.

Operating Officers.

F. Price has been appointed superintendent of car service of the Grand Trunk, with headquarters at Montreal, Que.

J. P. Welch has been appointed trainmaster of the Duluth & Iron Range, with headquarters at Two Harbors, Minn.

F. Walker has been appointed car service agent of the Canadian Pacific, Alberta division, with headquarters at Calgary, Alta., succeeding F. T. Anderson, assigned to other duties.

A. F. Moursund has been appointed assistant superintendent of the Galveston, Harrisburg & San Antonio, Houston division, with office at San Antonio, Tex., succeeding T. F. Sharp, resigned.

W. D. Stayton has been appointed assistant superintendent of the Houston East & West Texas and the Houston & Shreveport, with office at Houston, Tex., succeeding J. C. McVea, resigned.

D. H. Rawson, general superintendent of the United States Express Company, at St. Louis, Mo., has been appointed general manager of the Western department, with headquarters at Chicago.

Charles O'Hara, superintendent of the Union Refrigerator Transit Company, at Milwaukee, Wis., has been appointed general manager, and D. J. O'Connor succeeds Mr. O'Hara, with headquarters at Milwaukee.

S. K. Blair, superintendent of the Ft. Wayne division of the New York, Chicago & St. Louis, with office at Ft. Wayne, Ind., has been appointed general agent at Ft. Wayne, and will perform such duties as may be assigned by the general manager. E. J. Parrish, superintendent of telegraph, succeeds Mr. Blair. W. L. Blair, assistant to the general manager, has been appointed joint superintendent of telegraph of the Western Union Telegraph Company and the New York, Chicago & St. Louis, with headquarters at Cleveland, Ohio, in place of E. J. Parrish, and the office of assistant to the general manager is abolished. Effective September 1.

L. C. Browne, who has been appointed assistant general manager of the United Railways of Yucatan, with headquarters at Merida, Yucatan, Mex., was born on April 28, 1878, at Gainesville, Fla., and was educated at St. Leo Military College, St. Leo, Fla. He began railway work in 1894 as a check clerk in a local freight agent's office of the Plant System, now a part of the Atlantic Coast Line, and then held various positions in the mechanical department of the same road. In 1898 he went to the Norfolk & Western Steamboat Company, and in 1900 returned to railway work on the Baltimore & Ohio, remaining with that company until 1902. He was appointed secretary to the vice-president and general manager of the National Railways of Mexico in 1903, and subsequently was chief clerk to the general manager of the Tehuantepec National. In 1904 he became secretary to the president of the Veracruz & Pacific, and the following year was appointed secretary to the general manager of the Mexican Railway. From 1906 to 1912, he was chief clerk to the general manager of the same road, and now becomes assistant general manager of the United Railways of Yucatan, as above noted.

Edwin Ivanhoe Ford, whose appointment as superintendent of the Richmond division of the Chesapeake & Ohio, with headquarters at Richmond, Va., has been announced in these columns, was born on April 18, 1871, in Goochson county, Va., and was educated in the public schools. He began railway work in January, 1887, as a water boy on the piers of the Chesapeake & Ohio at Newport News, Va., and later became flagman. The following year he was made lamp tender and switchman, and from 1890 to 1897 was consecutively night yard clerk; day yard clerk; yard conductor, night yardmaster, assistant yardmaster and general yardmaster. In October, 1905, he became trainmaster at the Newport News terminal, and in January, 1909, was promoted to superintendent of terminals at Newport News, which position he held at the time of his recent appointment as superintendent of the Richmond division of the same road, as above noted.

E. I. Ford.

Traffic Officers.

W. H. Underwood, assistant general passenger agent of the Michigan Central, at Chicago, has been appointed assistant to the passenger traffic manager of the New York Central Lines West, with headquarters at Chicago.

Ira N. Peterson has been appointed agent of the New York Despatch Refrigerator Lines, National Despatch Refrigerator Line and the Chicago, New York & Boston Refrigerator Company, with headquarters at Detroit, Mich., in place of J. F. Baldwin, deceased.

F. C. Eslick has been appointed general agent of the Chicago Great Western at Mason City, Iowa, in charge of freight and passenger traffic. H. K. Hartman has been appointed commercial agent at Detroit, Mich., to succeed T. M. Smith, resigned. A. Kneubuehl succeeds Mr. Hartman as traveling freight agent, with headquarters at New York City, and F. C.

Campbell takes the place of Mr. Kneubuehl as traveling freight agent, with office at Buffalo, N. Y. Effective September 1.

Howard M. Biscoe, traffic manager of the Boston & Albany, at Boston, Mass., has been elected vice-president of the New York Central & Hudson River, in charge of all departments of the Boston & Albany, and his former position has been abolished. E. P. Gardiner, commercial agent of the Boston & Albany, at Boston, Mass., has been appointed assistant general freight agent, with office at South Station, Boston. H. A. Davis, commercial agent at Providence, R. I., has been promoted to commercial agent, with headquarters at Boston, and W. C. Schmidt, traveling freight agent at New Haven, Conn., succeeds Mr. Davis. (See Executive, Financial & Legal.)

E. P. Gardiner, who has been appointed assistant general freight agent of the Boston & Albany, with office at South Station, Boston, Mass., was born on January 31, 1875, at Chelsea, Mass., and after attending the public schools and a commercial school, entered the service of the Boston & Albany on July 6, 1895. He was promoted to contracting agent in September, 1898, then was with the Merchants Despatch Transportation Company until January, 1900, and subsequently was commercial agent at Providence. In February, 1907, he was transferred to Boston as agent of the New York Central Lines, and two years later was appointed commercial agent of the Boston & Albany, which position he held at the time of his recent appointment as general freight agent of the same road, as above noted.

C. F. Stewart, whose appointment as general passenger agent of the Western Maryland, with headquarters at Baltimore, Md., has been announced in these columns, was born at Covington, Ky., and at the age of 15 entered the office of a railway attorney at Cincinnati, Ohio, and later began railway work as a clerk in the general passenger office of the Marietta & Cincinnati, now part of the Baltimore & Ohio Southwestern. He was then consecutively, secretary to the general freight agent of the Pennsylvania Lines; city ticket agent of the Ohio & Mississippi; chief clerk in the general passenger office of the B. & O. S. W., and city ticket agent of the Chesapeake & Ohio, at Cincinnati, Ohio. In 1896 he went to the passenger department of the Southern Railway at Washington, D. C., and in 1901 became chief clerk in the passenger department of the Seaboard Air Line. He was later promoted to assistant general passenger agent of that road at Savannah. In 1909 he was appointed superintendent of the tariff department of the South Eastern Passenger Association at Atlanta, Ga., which position he held at the time of his recent appointment as general passenger agent of the Western Maryland, as above noted.

Engineering and Rolling Stock Officers.

Morris A. Zook, has been appointed engineer in charge of the valuation of the Grand Trunk-Wabash joint lines in Canada, with headquarters at Buffalo, N. Y.

A. Copony has been appointed master car builder of the Western lines of the Grand Trunk, with headquarters at Port Huron, Mich., succeeding J. L. Hodgson, transferred.

A. W. Duke has been appointed assistant supervisor of division No. 22, on the Tyrone division of the Pennsylvania Railroad, with office at Osceola Mills, Pa., succeeding C. M. Hursh, promoted.

The authority of F. M. Bisbee, chief engineer of the Western Lines of the Atchison, Topeka & Santa Fe, with headquarters at Amarillo, Tex., has been extended over the St. Louis, Rocky Mountain & Pacific.

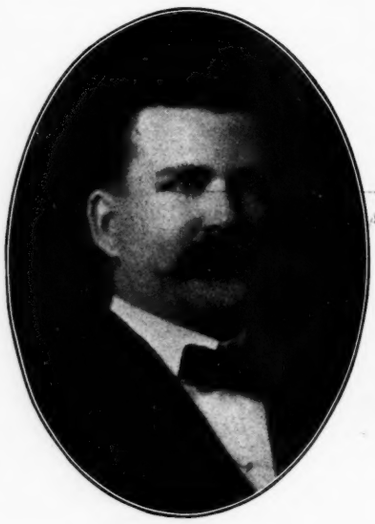
A. F. Blaess, assistant engineer of maintenance of way of the Illinois Central and the Yazoo & Mississippi Valley, with office at Chicago has been appointed district engineer of the Yazoo & Mississippi Valley, with office at Memphis, Tenn. J. C. Clifford, roadmaster at Carbondale, Ill., has been appointed district engineer of the northern lines, with headquarters at Chicago, and C. E. Weaver, roadmaster at New Orleans, La., has been appointed district engineer of the southern lines at New Orleans. The two latter offices have just been created and the district engineers will report to the general superintendents. D. W. Thrower, roadmaster at Chicago, succeeds Mr. Blaess. John F. Plott, supervisor at Carbondale, Ill., takes the place of Mr. Clifford. J. F. Watts, supervisor at New Orleans, succeeds Mr. Weaver. W. C. Costigan, roadmaster at Water Valley, Miss., has been transferred to Chicago in place of Mr. Thrower, and R. L. Hazelgrove, assistant roadmaster at Corinth, Miss., succeeds Mr. Costigan.

Purchasing Officers.

William D. Stokes has been appointed general storekeeper of the Central of Georgia, with office at Savannah, Ga., succeeding James L. Bennett, promoted.

W. M. Portlock, general storekeeper of the Seaboard Air Line at Portsmouth, Va., has been appointed assistant to the general purchasing agent, succeeding H. C. Macklin, resigned, and D. D. Cain succeeds Mr. Portlock.

James Lewis Bennett, who has been appointed purchasing agent of the Central of Georgia, with headquarters at Savannah, Ga., as has been announced in these columns, was born on December 17, 1874, at Savannah, and was educated in the grammar schools of his native town. He began railway work as a clerk in the car department of the Central of Georgia in September, 1890, and subsequently held various positions in that department and the mechanical department of the same road until September, 1906. He was then appointed general storekeeper, with headquarters at Savannah, which position he held at the time of his recent appointment as purchasing agent of the same road, with office at Savannah, as above noted.



J. L. Bennett.

OBITUARY.

C. M. Taylor, mechanical superintendent, Second district of the Chicago, Rock Island & Pacific, at Topeka, Kan., who was granted leave of absence on account of illness in July, died on September 3, at Colorado Springs, Colo. He was born on May 25, 1862, and had been with the Rock Island since December 15, 1906, as district master mechanic and mechanical superintendent, and was previously mechanical superintendent of the Western Grand division of the Atchison, Topeka & Santa Fe at La Junta, Colo.

John S. Cook, master mechanic of the Georgia Railroad, at Augusta, Ga., died on August 28, in John Hopkins Hospital, Baltimore, Md. Mr. Cook had been in railroad service sixty-four years, and it is probably safe to say that previous to his last illness he was, in point of years of service, the oldest railroad officer in the United States. He was born on October 5, 1827, at Brooklyn, N. Y., and began railway work in April, 1849, as machinist in the shops of the Central Railroad at Savannah, Ga. Later he was machinist in the shops of the Georgia Railroad at Augusta. From 1850 to 1853 he was a locomotive engineer on that road; then from 1854 to 1878, about twenty-five years, he was foreman of shops. On the election of General E. P. Alexander to the presidency of the Georgia Railroad, in May, 1878, he was made master mechanic, and had held that position ever since. Mr. Cook was well known in the railroad mechanical world and was highly respected. Before entering railroad service he served an apprenticeship at the Baldwin Locomotive Works, and on leaving the Baldwin shops in 1849, he received a testimonial from Matthias W. Baldwin, a fac-simile of which is shown in another column.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE CHICAGO, BURLINGTON & QUINCY is said to be considering the purchase of a number of Santa Fe type locomotives and a number of Pacific type locomotives. This item has not been confirmed.

THE NORFOLK & WESTERN has ordered one 130-ton electric locomotive from the Baldwin Locomotive Works and the Westinghouse Electric & Manufacturing Company. If this locomotive proves satisfactory 23 of the same type will be ordered by this road.

THE INTERNATIONAL & GREAT NORTHERN has ordered 3 oil-burning consolidation locomotives from the American Locomotive Company. The dimensions of the cylinders will be 22 in. x 30 in., the diameter of the driving wheels will be 57 in. and the total weight in working order will be 217,000 lbs.

THE CARNEGIE STEEL COMPANY, Pittsburgh, Pa., has ordered 4 six-wheel switching locomotives from the American Locomotive Company. The dimensions of the cylinders will be 22 in. x 26 in., the diameter of the driving wheels will be 51 in. and the total weight in working order will be 150,000 lbs.

CAR BUILDING.

GRAND RAPIDS & INDIANA has ordered 60 steel gondolas from the Cambria Steel Company, and 85 flat cars from the Pressed Steel Car Company.

IRON AND STEEL.

THE MAINE CENTRAL has ordered 400 tons of structural material from the Phoenix Bridge Company.

THE CINCINNATI, HAMILTON & DAYTON has ordered 11,000 tons of structural material from the American Bridge Company.

GENERAL CONDITIONS IN STEEL.—The orders of the steel corporation for rolled steel products for August were more than 25 per cent. larger than for July. The corporation produced over 1,000,000 tons of these products during August; ingot production was about 5 per cent. more than that of July. A large number of the orders placed during August were for future requirements, which accounts for the increase over July. Orders during the past week have been very meager, but a marked improvement in the buying movement is looked for this month. There has been some price cutting, and consumers are holding off in expectation of further reductions.

SIGNALING.

The General Railway Signal Company, Rochester, N. Y., has taken a contract for the installation of automatic block signals on the Toronto, Hamilton & Buffalo, from Vinemount, Ont., to Welland, 27 miles. With the completion of this installation the line will be block signaled throughout its length from Hamilton to Welland, 38 miles.

AUSTRALIAN RAILWAY IMPROVEMENTS.—Plans for alterations to be made at the Geelong railway station have been forwarded to the local town clerk. The work, which is to be started soon, will consist of construction of a subway, the erection of new locomotive sheds, the lengthening of the passenger platform and rearrangements of the yard, the whole involving an expenditure of $500,000.

PARCELS POST IN AUSTRALIA.—As the result of the expansion of the parcels business in Australia, the railway commissioners have had under consideration the establishment of a motor delivery service. During the financial year just closed the revenue derived from the carriage of parcels was nearly $1,250,000, but it is considered that if facilities for delivery were provided, the receipts would be considerably increased.

Supply Trade News.

Isham Randolph, consulting engineer, Chicago, has removed his offices to suite 1807, Commercial National Bank building, Chicago.

The Bush type of train shed, invented and patented by Lincoln Bush, E. D., 1 Madison avenue, New York, has been adopted as standard by the Canadian Pacific and will be used to cover the 11 tracks of its new Windsor street station at Montreal, Que.

The Canada Iron Corporation, Fort William, Ontario, has announced its voluntary liquidation. The company has six large plants in Canada, manufacturing car wheels, brake shoes, sewer pipes, etc., and owns several iron mines. It is stated that the company will probably be reorganized.

The Philadelphia Steel & Forge Company, Tacony, Philadelphia, Pa., has just installed in the rolling mill department of its Tacony works a new power plant which will increase the output of finished bars 2,000 tons a month. This company has also installed a heat-treating plant and is specializing on high-grade steels for locomotives, machine tools, etc.

John C. Kuhns, whose resignation as purchasing agent of the Illinois Central and appointment as vice-president of the Burden Sales Company was noted in our issue of August 22, is associated with Fred. Gardner in representing that company, the Pearsall Company, and the Oxweld Railroad Service Company, with offices at 341 Railway Exchange building, Chicago.

Ernest F. Slocum, formerly vice-president of the Safety Car Heating & Lighting Company, New York, has returned to that company as assistant to the president, a position which has not been filled for some time. Mr. Slocum was born in Newark, N. J., in 1870, and spent his boyhood days in St. Louis, Mo., where he received his early education. He started his business career as a journalist, and was connected with the New York *Herald* and the *Commercial Advertiser*, also of New York. Later he was made director and manager of the *Daily Advertiser* of Newark, N. J. In 1895 he went to the Safety Car Heating & Lighting Company, accepting a position offered him by the late Colonel A. W. Soper. In May, 1907, he was made a vice-president of that company having charge of sales. In October of that year he suffered a nervous breakdown and has been out of business up to the time of his appointment as assistant to the president of the Safety company as mentioned above.

Ernest F. Slocum.

TRADE PUBLICATIONS.

PROTECTED SHEET STEEL.—The Asbestos Protected Metal Company, Beaver Falls, Pa., has issued an illustrated bulletin describing its "Asbesto-Steel" for roofs and walls, including a large number of installations in railway work.

WELDING APPARATUS.—The C. & C. Electric & Manufacturing Company, Garwood, N. J., has published bulletin No. 513-C on its electric arc welding apparatus. This bulletin is illustrated and gives valuable information on this subject.

COMPRESSORS, DRILLS, ETC.—The Ingersoll-Rand Company, New York, has published a 140-page illustrated catalog of its compressors, drills, pneumatic tools, and accessories. This catalog gives prices, capacities and dimensionsions, and includes over 20 pages of useful information in tabular form.

Railway Construction.

Baltimore & Ohio.—An officer writes that this company is making surveys for the construction of a cut-off between Monongah and Gaston Junction, a point east of Fairmont, W. Va., about two miles. Through business to the west will be routed over the cut-off and the West Virginia Short Line division, instead of through Fairmont and over the Wheeling division. The cut-off will provide easier grades than the existing lines, and will also save a distance of approximately five miles.

California, Oregon & Eastern.—An officer writes that work is now under way building from Grants Pass, in Josephine county, Ore., southwest to Crescent City, in Del Norte county, Cal., on the Pacific coast, 91 miles. The construction work on 60 miles will be light and on 30 miles the work will be very heavy. There will be 10 steel bridges having an average length of 200 ft., also about 75 trestles and three tunnels. Track has been laid on 14 miles. The company expects to develop a traffic in timber, minerals and farm products. J. M. Meeland, president, W. W. Harmon, chief engineer, Grants Pass. (August 1, page 211.)

Canadian Pacific.—The report of this company for the year ended June 30, 1913, shows that the company has 1,325 miles under construction, on which work is now under way as follows:

Name.	Miles.
Ontario Division.	
Campbellford, Lake Ontario & Western; Glen Tay, to Agincourt	182.3
Lake Superior Division.	
Interprovincial & James Bay Ry.; from Kipawa, Que., north	10.0
Manitoba Division.	
Selkirk Branch; from Gimli, Man., north	26.0
Snowflake Branch; Snowflake, Man., west	9.0
Virden Branch; Virden, Man., to McAuley	36.2
Souris Branch and extension; Boissevain, Man., to Lauder	37.0
Saskatchewan Division.	
Estevan Branch; Estevan, Sask., to Forward	55.0
Weyburn Branch; from Weyburn, Sask., west	205.7
Alberta Division.	
Swift Current North branch; from Swift Current, Sask., north	76.7
Coronation north	25.0
Stirling East branch; Stirling, Alta., east	50.0
Bassano East branch; Bassano, Alta., to Empress	118.3
Suffield branch; from Suffield, Alta., southwest	82.0
Gleichen branch; Gleichen-Shepard, Alta	40.0
Alberta Central; from Red Deer, Alta., west	65.0
Kootenay Central; Fort Steele North branch	84.0
Calgary & Edmonton; from Lacombe, Alta., east	115.2
British Columbia Division.	
Kootenay Central; Golden, B. C., south	60.0
Esquimalt & Nanaimo; Osborne Bay Junction, B. C., to Crofton	2.6
McBride Jct., to Courtenay	45.0
Total	1,325.0

Second track work now under way includes the following: Between Islington and Guelph Junction on the Ontario division, 29 miles; between Sudbury, Ont., and Port Arthur on the Lake Superior division, 133 miles; between Brandon, Man., and Calgary, Alta., 178 miles. There will also be 18 miles of second track laid and grade improvements made in connection with the building of the double track tunnel five miles long between Six Mile Creek and the Loop near the summit of the Selkirk mountains, and 139 miles of second track between Revelstoke, B. C., and Vancouver, at various points where it will give the most immediate relief. When this work is finished and the new lines between Regina and Shepard are constructed there will be 200 miles of double track between Sudbury and Port Arthur, leaving 352 miles yet to be laid. Between Port Arthur and Calgary there will be 1,095 miles of double track, leaving gaps aggregating 165 miles, and between Calgary and Vancouver there will be 158 miles of double track, leaving 488 miles to be built.

Chicago, Milwaukee & St. Paul.—An officer writes confirming the report that a contract has been given to the Keasel Construction Company, Tacoma, Wash., to build a section on the Puget Sound & Willapa Harbor. The plans call for building from Raymond, Wash., on Willapa harbor east to Chehalis, thence north via Centralia to Maytown, 65 miles. Track has been laid on 10 miles. The company expects to develop a traffic in lumber and farm products. C. H. Byers, Raymond, Wash., chief engineer of the Puget Sound & Willapa Harbor. (August 15, p. 313.)

Dakota Eastern.—Incorporation has been asked for in South Dakota by this company with a capital of $800,000 to build from Clear Lake, in Marshall county, S. Dak., south through Day county to Watertown in Coddington county, about 48 miles. The incorporators include W. E. Egeland, H. D. Barnett and E. Merhangen, St. Paul, Minn., H. F. Harp and A. E. Chillson, Webster, S. Dak.

Dallas, Corsicana & Palestine.—An officer writes that grading work is now under way and involves handling 30,000 cu. yds. to the mile. The company was organized last year to build from Palestine, Tex., northwest through Anderson and Navarro counties to Corsicana. The maximum grades will be 1 per cent., and maximum curvature 4 deg. The company expects to develop a traffic in lumber, cotton, lignite, etc. L. E. Mitchell, president, Neosho, Mo. H. Hedberg, chief engineer, Dallas, Tex. (August 22, p. 353.)

Dallas, Fairfield & Gulf.—An officer writes that the company plans to build from Dallas, Tex., southeast via Ferris, and probably via Kerens, to a point on the International & Great Northern. It has not been determined when contracts will be asked for the work. T. J. Alexander, president, Teague, Tex., and Woolsey Fennell, chief engineer, Tuscaloosa, Ala. (June 27, page 1631.)

Denver & Salt Lake.—The Denver tunnel commission has submitted to this railway for approval a contract, authorized by a city ordinance, providing for a loan of $3,000,000 by the city to aid in the construction of the proposed six-mile tunnel under James Peak. A city election to authorize a bond issue for the amount is expected to be held in October. Provision is made so that the company may acquire title to the tunnel.

Duluth & Iron Range.—An officer writes that a grading contract has been given to Charles M. Magrinson, for work on a logging line from mile 108 near Robinson station, Minn., north to Burnside lake, 3.18 miles. The grading work which involved handling 10,000 cu. yds. to the mile is 90 per cent. completed and the company will carry out the track laying with its own forces.

Erie.—Plans have been submitted by the city engineer of Youngstown, Ohio, calling for the depression of the tracks of the Erie and the Pittsburgh & Lake Erie. It is understood that the plans have been accepted by the railroad companies. A court decision requires these roads to bear 65 per cent. and the city of Youngstown 35 per cent. of the cost of eliminating 12 grade crossings in Youngstown.

Georgia Coast & Piedmont.—An officer writes that the company expects to have the 15 mile extension from Darien, Ga., south to Brunswick, including the four bridges over the Altamaha river, completed about November 1. A contract was given last year to the Glynn County Construction Company to carry out the work. (July 19, 1912, p. 143.)

Henryetta Interurban.—Application has been made in Oklahoma for a charter to build about 100 miles in Oklahoma. The projected route is from Henryetta to Muskogee on the east and to Okemah and Shawnee on the West. The directors include W. Brink, J. Kincaid, C. J. Harrison and C. H. Kellogg.

Jefferson County Traction.—This company has finished track laying on the line from Port Arthur, Tex., north to Beaumont, 25 miles. The company is a subsidiary of the Stone & Webster Engineering corporation of Boston, Mass. It is said that the same interests have under consideration the question of building an interurban line between Beaumont and Houston, about 80 miles. The proposed line is to connect at Houston with the interurban line that runs to Galveston, the latter being also a Stone & Webster property. The same interests are building an interurban electric line from El Paso down the valley of the Rio Grande to Ysleta. (September 20, 1912, p. 559.)

Lake Erie & Eastern.—See Pittsburgh & Lake Erie.

Lake Erie & Youngstown (Electric).—This company is said to have started work on the line to connect Youngstown, Ohio, with Conneaut, about 65 miles. A. W. Jones, J. H. Ruhlman

and G. M. Brown, Youngstown, are interested. (January 10, page 87.)

PITTSBURGH & LAKE ERIE.—Additional contracts for extending the Lake Erie & Eastern from the Brier Hill Steel Company's plant in Youngstown, Ohio, northwest to Niles, have been let to the McKelvey-Hine Construction Company, Pittsburgh, it is said. The contract calls for building a single track line about 10 miles long. (May 31, 1912, page 1221.)

See Erie Railroad.

PORTLAND, EUGENE & EASTERN (Electric).—An officer writes regarding the reports that extensions of the Alpine and Bellfountain branches will be built in Oregon, that the company will build an extension about a mile and a half long in connection with some logging operations. One of these branches is about 10 miles long and one about seven miles.

PUGET SOUND & WILLAPA HARBOR.—See Chicago, Milwaukee & St. Paul.

SALT LAKE & ALTA.—Incorporated in Utah to build a line to the granite quarries in the Little Cottonwood canyon, and to the Alta mining district. Work is now under way between Midvale, Utah, and Wasatch, on about 11 miles up Little Cottonwood canyon. The grading is finished and track has been laid on four miles. J. G. Jacobs, president; F. P. Jacobs, vice-president; E. C. Ashton, secretary and treasurer; George E. Cutler, W. O. Williams, Norman W. Haire and C. W. Blethen, are directors.

SAN RAFAEL & SAN ANSELMO VALLEY (Electric).—An officer writes that this company has been incorporated in California with $100,000 capital. Surveys are to be started in about a month for a three-mile line through the streets of San Rafael, Cal., thence westerly, via San Anselmo to Fairfax, about six miles. The company expects to use Beach storage battery cars on the line. E. S. Rake, president, S. J. Norton, vice-president, San Rafael.

TORONTO, HAMILTON & BUFFALO.—An officer writes that this line is being double tracked between Welland, Ont., and Fenwick, six miles, and second track is being laid across the Welland river, where a pile trestle is being constructed adjacent to the present through truss bridge prior to the permanent construction which will be determined when the government has indicated its requirements with regard to draw span. The contractor for the grading is J. L. Boyd, Toronto. The passing sidings between Welland and Hamilton are being lengthened to 75 car capacity westbound and 90 car capacity eastbound. The sidings are lapped to provide convenient layout for operation and signaling. Stone ballasting has been completed and twelve miles of 100 lb. rail are being laid between Vinemount and Hamilton, which includes the mountain section. New 100,000 gal. steel tanks have just been completed at Smithville and at Welland, and two new team yards in Hamilton of 94 cars capacity are about completed.

VAN HORN VALLEY.—Plans are being made, it is said, to build a 200-mile line from Lobo, Tex., via Crow Flat into New Mexico. The company has a capital of $1,500,000. R. H. Owen, president, Minneapolis, Minn. The incorporators include J. M. Daugherty, J. Y. Canon and J. Irby, all of Van Horn, Tex.

RAILWAY STRUCTURES.

WELLAND, ONT.—See Toronto, Hamilton & Buffalo, under Railway Construction.

WOONSOCKET, R. I.—The New York, New Haven & Hartford is carrying out improvements at Woonsocket, to include a new yard covering 10 acres of land, to have 19 tracks; also a new outbound freight house 30 ft. x 400 ft., and an inbound freight house 60 ft. x 400 ft. A two story brick office building is also included in the improvements. Work on the freight houses is nearing completion.

CHILI AND INTERNATIONAL RAILWAYS.—The Chilian minister of industry recently announced in the Senate that the government would give no facilities for the construction of international railways as long as no commercial treaties between Chili and the neighboring countries existed.

Railway Financial News.

BALTIMORE & OHIO.—The New York Stock Exchange has listed an additional $5,000,000 first mortgage 4 per cent. bonds of 1898-1948. The proceeds of these bonds were used to pay for improvements as follows: Double tracking the Chicago division, $2,680,485; terminal and yard improvements, $1,224,011; track elevation, $584,875; other capital expenditures, $570,932.

BRINSON RAILWAY.—The Georgia railroad commission has approved the issue of $5,000,000 first mortgage and refunding bonds, a part of which may be used to secure $1,250,000 2-year 6 per cent. notes. This road runs from Savannah, Ga., to Waynesboro, 96 miles.

BROOKLYN RAPID TRANSIT.—N. F. Brady has been elected chairman of the board, succeeding his father, A. N. Brady, deceased.

CANADIAN NORTHERN.—This company recently sold in London, at a price to the public of 98 per cent., £1,500,000 ($7,500,000) 5 per cent. secured notes.

CANADIAN PACIFIC.—See editorial comments on the annual report in this issue.

LAKE SHORE & MICHIGAN SOUTHERN.—This company has sold in London £420,000 ($2,100,000) one-year notes dated September 6. The notes were discounted in advance.

MICHIGAN CENTRAL.—This company has sold $2,000,000 one-year 6 per cent. notes dated August 27.

NEW YORK CONNECTING.—The New York Public Service Commission has been asked for its approval of an issue of $30,000,000 bonds, of which $11,000,000 4½ per cent. bonds are to be deposited as security for $10,000,000 4½ per cent. 3-year notes. The notes are to be guaranteed principal and interest jointly by the Pennsylvania Railroad and the New York, New Haven & Hartford. The New York Connecting is the road which is building a connection between the New York, New Haven & Hartford and the Pennsylvania's Long Island Sunnyside yards.

VALDOSTA, MOULTRIE & WESTERN.—B. P. Jones, A. L. Davis and C. I. Harrell have been appointed co-receivers, Mr. Jones having, as previously announced in these columns, been appointed temporary receiver.

EXPANSION OF GOVERNMENT RAILWAYS IN AUSTRALIA.—An addition has been made to the government railway system in western Australia by the state taking over the hitherto privately-owned line from the Margaret river to Flinders bay. This line was used for hauling timber from the forest to the seaboard. It traverses a tract of rich country eminently suited for dairying. It is now the government's intention to make the line part of a big extension of the state system, a project being under consideration for the construction of a railway from the port of Busselton southwards, and of which the newly acquired line will form a link. The Margaret River-Flinders Bay line will be run entirely for the convenience of settlers in the district, but later on will be used to handle the heavy traffic of a much more extensive territory.

CROP OUTLOOK IN WESTERN AUSTRALIA.—The outlook for the farmers in western Australia this season is particularly bright. Excellent rains have fallen over the whole of the agricultural areas, and although the season is late there is every promise of a splendid harvest and a record wheat yield. The railway officers are busy preparing for the rapid transportation of the crops to the seaboard. It is hoped that ample provision will be made for rolling stock, or there will be serious financial loss to the revenue of the state and complaints from the farmers similar to what took place lately in the states of Victoria and Queensland. These states have, however, minimized the risk of congestion of future bumper crops by the recent addition of a number of British built locomotives. Although it is the policy of the states to build their own engines, it is difficult with the existing building plant in the states to cope with the demands and rapid agricultural developments.

[ADVERTISEMENT.]

ANNUAL REPORT.

CANADIAN PACIFIC RAILWAY COMPANY—THIRTY-SECOND ANNUAL REPORT—YEAR ENDED JUNE 30th, 1913.

To the Shareholders.

The accounts of the Company for the year ended June 30th, 1913, show the following results:—

Gross Earnings		$139,395,699.98
Working Expenses		93,149,825.83
Net Earnings		$ 46,245,874.15
Net Earnings of Steamships in excess of amount included in monthly reports		1,245,563.03
		$ 47,491,437.18
Deduct Fixed Charges		10,876,352.15
Surplus		$ 36,615,085.03
Deduct amount transferred to Steamship Replacement Account	$1,000,000.00	
Contribution to Pension Fund	125,000.00	1,125,000.00
		$ 35,490,085.03
From this there has been charged a half-yearly dividend on Preference Stock of 2 per cent., paid April 1st, 1913	$1,473,386.53	
And three quarterly dividends on Ordinary Stock of 1¾ per cent. each, paid January 2nd, 1913, April 1st, 1913, and June 30th, 1913	10,150,000.00	
And interest on instalments on New Stock Subscriptions, paid October 15th, 1912	569,813.87	$ 12,193,200.40
		$ 23,296,884.63
From this there has been declared a second half-yearly dividend on Preference Stock, payable October 1st, 1913	$1,486,626.79	
And a fourth quarterly dividend on Ordinary Stock of 1¾ per cent., payable October 1st, 1913	3,500,000.00	$ 4,986,626.79
Leaving net surplus for the year		$ 18,310,257.84

In addition to the above dividends on Ordinary Stock, three per cent. was paid from Special Income.

THE FOLLOWING ARE THE DETAILS OF SPECIAL INCOME FOR YEAR ENDED JUNE 30TH, 1913.

Balance at June 30th, 1912	$2,460,790.60
Interest on Cash Proceeds and on Deferred Payments for land sold	2,031,785.05
Interest on Deposits and Loans	1,201,906.69
Interest on Can. Pac. Ry. 1st Mortgage Bonds acquired	63,461.33
Interest from Minneapolis, St. Paul & Sault Ste. Marie Ry. Bonds	159,720.00
Interest from Mineral Range Ry. Bonds	50,160.00
Interest from Toronto, Hamilton & Buffalo Ry. Bonds	10,840.00
Interest from Kingston & Pembroke Ry. Bonds	8,565.00
Interest from Dominion Government Bonds	182,500.00
Interest from Ontario Government Bonds	48,000.00
Interest from British Consols	114,569.44
Interest from Montreal & Atlantic Ry. Bonds, and on other Securities	552,298.89
Interest from Berlin, Waterloo, Wellesley & Lake Huron Ry. Bonds	17,040.00
Dividend on St. John Bridge & Ry. Extension Co. Stock	75,000.00
Dividends on Dominion Express Co. Stock	240,000.00
Dividends on Minneapolis, St. Paul & S.S.M. Ry. Common Stock	890,645.00
Dividends on Minneapolis, St. Paul & S.S.M. Ry. Preferred Stock	445,326.00
Dividends on West Kootenay Power & Light Co. Common Stock	33,000.00
Dividends on West Kootenay Power & Light Co. Preferred Stock	3,850.00
Dividends on Toronto, Hamilton & Buffalo Ry. Stock	164,246.00
Net Revenue from Company's Coal Mines	305,237.93
	$9,058,941.93
Less—Payments to Shareholders in dividends: October 1st, 1912, January 2nd, 1913, April 1st, 1913, and June 30th, 1913	5,700,000.00
	$3,358,941.93
From this a dividend has been declared, payable October 1st, 1913	1,500,000.00

2. The working expenses for the year amounted to 66.82 per cent. of the gross earnings, and the net earnings to 33.18 per cent. as compared with 64.89 and 35.11 per cent., respectively, in 1912.

3. Four per cent. Consolidated Debenture Stock to the amount of £1,938,394 was created and sold, and of the proceeds the sum of £1,051,619 was applied to the construction of authorized branch lines, and £886,775 was devoted to the acquisition of the bonds of other Railway Companies whose lines constitute a portion of your system, the interest on which had, with your sanction, been guaranteed by your Company.

4. Four per cent. Preference Stock to the amount of £1,569,091 was created and sold, the proceeds being used to meet capital expenditures that had your previous sanction.

5. Your guarantee of interest was endorsed on Four per cent. Consolidated Bonds of the Minneapolis, St. Paul and Sault Ste. Marie Railway Company to the amount of $2,623,000, issued and sold to cover the cost of 131.15 miles of railway added to that Company's system.

6. During the year 474,798 acres of agricultural land were sold for $7,487,268, being an average of $15.77 per acre. Included in this area there were 7,944 acres of irrigated land which brought $48.88 per acre, so that the average price of the balance was $15.20 per acre.

7. Shares of ordinary Capital Stock to the amount of $2,000,000.00, being the difference between the Capital Stock outstanding and the amount authorized by the shareholders October 7th, 1908, were sold in the market early in the year and realized a premium of $2,860,821.80, which will be used for additions and improvements to your property.

8. In pursuance of your policy of building and extending branch lines in Western Canada to provide present and incoming settlers with transportation facilities, a line is projected from a point near Swift Current, on your main line in Saskatchewan, in a north-westerly direction to cross your Lacombe branch at or about Coronation, and eventually to reach Sedgewick, a station on your line between Saskatoon and Edmonton, a total distance of 290 miles. The first 115 miles of this line should be constructed without delay, and the balance in stretches as circumstances may seem to warrant; two other lines, one of which will run north-easterly from Bassano, on your main line in Alberta, to a connection with the Swift Current line, a distance of 118 miles, and the other from Gleichen to Shepard a distance of 10 miles, should be built within the next year. These lines will serve important agricultural districts north and south of your main line and will answer all the purposes of a second track between the points mentioned for some years to come. The Weyburn branch, running south of, and parallel to, your main line in Saskatchewan and Alberta, to a connection with your Alberta Railway south of Lethbridge, a total distance of 436 miles, of which 196 miles have been constructed, or are in process of construction, under your authority, should be further extended year by year until completed. Branch lines from Gimli, Manitoba, in a northerly direction for a distance of 26 miles, and from Snowflake, Manitoba, in a westerly direction, a distance of 9 miles, and an extension of the Suffield branch in Saskatchewan, 27 miles, will be of substantial service to settlers in these respective districts.

Your Directors will ask you to sanction the construction of such part of this mileage as you have not already authorized, and the issue, from time to time, of the requisite 4% Consolidated Debenture Stock to meet the expenditure.

9. Among the important additions and improvements now in process of execution are, 29 miles of second track between Islington and Guelph Junction, on the Ontario Division, to cost $750,000; 133 miles of additional second track between Sudbury and Port Arthur, on the Lake Superior Division, to cost $5,300,000; 178 miles of additional second track between Brandon and Calgary, to cost approximately $5,000,000; 18 miles of second track and grade improvements, including a double track tunnel, five miles in length, between Six Mile Creek and the "Loop," near the summit of the Selkirk Mountains, at a cost, without electrification, of about $8,000,000; 139 miles of second track between Revelstoke and Vancouver, in stretches where it will give the most immediate relief, to cost $6,350,000.

When this work is finished and the new lines between Regina and Shepard, to which reference has already been made, are constructed, there will be 200 miles of double track between Sudbury and Port Arthur, leaving 352 miles to be provided in the future; between Port Arthur and Calgary there will be 1095 miles of double track, leaving gaps aggregating only 165 miles, and between Calgary and Vancouver 158 miles of double track, leaving 488 miles to be built hereafter.

A second track on such a large portion of your main line between Sudbury and the Pacific Coast will relieve the congestion that has prevailed from time to time and will enable you to handle your traffic more expeditiously and economically, and the construction of the long tunnel, between Six Mile Creek and the "Loop," will eliminate four and one-half miles of snow-sheds that it would be necessary to reconstruct at very great expense if the present location of the railway through that section were adhered to. It is not the intention of your Directors to proceed with the second track in the more difficult sections along the Thompson and Fraser Rivers until your Kettle Valley Line is ready for traffic between Midway and Hope, in 1915, so that you may have an alternative route available between Medicine Hat and Vancouver via the Crows Nest Pass if anything unforeseen should occur during the prosecution of the double track work to obstruct traffic on the main line.

10. You will be asked to approve the purchase of two intermediate steamships for the Atlantic trade, 500 feet long, 64 feet beam, 11,600 gross tonnage, 15 knots speed, to cost approximately £300,000 each, and two steamships for the Pacific Coast service, 395 feet long, 54 feet beam, capable of making 22½ knots per hour at sea, and to cost approximately £200,000 each.

The two Atlantic steamships are urgently required for your second and third class passengers and freight traffic between European ports and Canada, and the two fast passenger steamers for the Pacific Coast will further improve the excellent service that you are now providing for the large and growing passenger business between Vancouver, Victoria and other ports on the Pacific Coast.

11. When the last issue and sale of ordinary capital stock was authorized by you, a portion of the proceeds of the sale was directed to be applied to the retirement of the outstanding five per cent. First Mortgage Bonds of the Company that mature in 1915, and, therefore, your Directors deemed it desirable to give notice to the holders in May last that the Company would receive and pay for any of the Bonds that might be surrendered before the end of the fiscal year. Pursuant to this notice Bonds to the amount of £4,234,700, or $20,608,873.33, were delivered and paid for. These, with the Bonds that the Company had previously acquired, make a total of £4,487,900, or $21,841,113.33, that have been retired and cancelled, leaving outstanding Bonds to the amount of £2,703,600, or $13,157,520.00, to be redeemed and cancelled as opportunity offers.

12. For the convenience of those desiring to make transfers in Montreal of shares of your ordinary capital stock, the Bank of Montreal has been appointed Registrar and the Royal Trust Company has been appointed Transfer Agent for the Montreal Register, and a by-law giving effect to the appointments will be submitted for your consideration and approval.

13. It will be observed that the mileage covered by the statement of gross earnings and working expenses has increased from 10,983 miles in 1912 to 11,602 miles in this fiscal year. The business of a number of these new lines will naturally add but little to your gross income for a time while traffic is being developed, but meantime their maintenance and operation have a marked effect on the working expenses. This, coupled with more liberal expenditure for maintenance of way and of equipment and advances in the wage scale in some branches of the service, will account, in a large measure, for the abnormal increase in your working expenses over the previous year.

14. The item "Railway and Equipment" in the balance sheet is $69,491,729.27 more than it was in 1912, after applying upwards of $10,000,000 from surplus account. Of this amount $30,137,885.86 represents the cost of additional rolling stock, $9,113,050.21 the expenditure for the construction of branch lines, $36,809,675.82 for additions and improvements to your property, and $3,126,347.32 for additional shops and machinery over the whole system.

15. The undermentioned Directors will retire from office at the approaching Annual Meeting. They are eligible for re-election:—

Mr. David McNicoll
Mr. Charles R. Hosmer
Hon. Robert Mackay
Hon. James Dunsmuir.

For the Directors,

F. G. SHAUGHNESSY,
President.

MONTREAL, August 11th, 1913.

CANADIAN PACIFIC RAILWAY COMPANY. CONDENSED BALANCE SHEET, JUNE 30, 1913.

RAILWAY AND EQUIPMENT		$452,320,780.60
OCEAN, LAKE AND RIVER STEAMSHIPS		23,049,283.21
ACQUIRED SECURITIES (COST):		
Exhibit "A"		100,207,933.88
PROPERTIES HELD IN TRUST FOR THE COMPANY		4,386,260.00
DEFERRED PAYMENTS ON LAND AND TOWN SITE SALES		44,499,115.78
ADVANCES TO LINES UNDER CONSTRUCTION		13,750,205.47
ADVANCES AND INVESTMENTS		12,072,811.65
MATERIAL AND SUPPLIES ON HAND		18,628,206.99
CURRENT ASSETS:		
Agents and Conductors Balances	$4,118,739.47	
Net Traffic Balances	120,713.25	
Miscellaneous Accounts Receivable	7,013,831.74	
		11,253,284.46
TEMPORARILY INVESTED IN GOVERNMENT SECURITIES		10,088,734.86
CASH ON HAND		30,274,848.30
		$720,531,465.20

NOTE.—In addition to above assets, the Company owns 6,287,250 acres of land in Manitoba, Saskatchewan and Alberta (average sales past year $15.77 per acre), and 1,697,994 acres in British Columbia.

AUDITORS' CERTIFICATE.

We have examined the Books and Records of the Canadian Pacific Railway Co., for the fiscal year ending June 30th, 1913, and having compared the annexed Balance Sheet and Income Account therewith, we certify that, in our opinion, the Balance Sheet is properly drawn up so as to show the true financial position of the Company at that date, and that the relative Income Account for the year is correct.

Montreal, August 8th, 1913. PRICE, WATERHOUSE & CO., Chartered Accountants (England).

CAPITAL STOCK		$200,000,000.00
PAYMENTS ON SUBSCRIPTION TO NEW ISSUE CAPITAL STOCK ($60,000,000.00 @ 175)		63,451,667.50
FOUR PER CENT PREFERENCE STOCK		74,331,339.79
FOUR PER CENT. CONSOLIDATED DEBENTURE STOCK		163,257,224.32
MORTGAGE BONDS:		
First Mortgage, 5 per cent.	$34,998,633.33	
Less amount redeemed and cancelled	21,841,113.33	
		13,157,520.00
Algoma Branch, 1st Mortgage		3,650,000.00
CURRENT LIABILITIES:		
Audited Vouchers	14,785,322.70	
Pay Rolls	6,549,901.24	
Miscellaneous Accounts Payable	9,176,078.79	
		30,511,302.73
INTEREST ON FUNDED DEBT AND RENTAL OF LEASED LINES:		
Coupons due July 1st, 1913, and including Coupons overdue not presented	1,208,016.17	
Accrued Fixed Charges	183,785.05	
		1,391,801.22
EQUIPMENT OBLIGATIONS		880,000.00
EQUIPMENT REPLACEMENT FUND		2,425,426.02
STEAMSHIP REPLACEMENT FUND		5,061,338.29
APPROPRIATION FOR ADDITIONS AND IMPROVEMENTS		17,912,996.41
RESERVE FUND FOR CONTINGENCIES		3,569,463.37
LANDS AND TOWN SITES SALES		63,334,285.19
SURPLUS		77,597,100.36
		$720,531,465.20

I. G. OGDEN, *Vice-President.*

FIXED CHARGES FOR YEAR ENDED JUNE 30TH, 1913.

£7,191,500	1st Mortgage Bonds 5% due July 1st, 1915		$ 1,749,931.66
£ 200,000	St. Lawrence & Ottawa Ry. 4% 1st Mortgage Bonds		38,933.34
$2,544,000	Man. S. West. Colzn. Ry. 1st Mortgage 5% Bonds due June 1st, 1934		127,200.00
	Toronto, Grey & Bruce Ry. Rental		140,000.00
£4,007,381 15 5	Ontario & Quebec Ry. Debenture Stock 5%		975,129.56
$2,000,000	Ontario & Quebec Ry. Ordinary Stock 6%		120,000.00
£1,330,000	Atlantic & North West Ry. 1st Mortgage Bonds due January 1st, 1937		323,633.34
£ 750,000	Algoma Branch 5% 1st Mortgage Bonds, due July 1st 1937		182,500.00
$ 500,000	New Brunswick Southern Railway 1st Mortgage Bonds, 3%		15,000.00
$ 500,000	Lindsay, Bobcaygeon & Pontypool Ry. 1st Mortgage Bonds, 4%		20,000.00
£ 256,800	Shuswap & Okanagan Ry. 1st Mortgage Bonds, 4%		49,990.40
	Rental, Calgary & Edmonton Ry.		218,357.60
	Rental, Farnham to Brigham Jct.		1,400.00
	Rental, Mattawamkeag to Vanceboro		23,800.00
	Rental, New Brunswick Ry. System		372,829.74
	Rental, Terminals at Toronto		24,459.56
	Rental, Terminals at Hamilton		36,817.60
	Rental, Hamilton Jct. to Toronto		42,191.12
	Rental, St. Stephen & Milltown Ry.		2,050.00
	Rental, Joliette & Brandon Ry.		5,000.00
	Rental, Lachine Canal Branch		939.96
	Interest on Montreal & Western Ry.		14,733.42
	Interest on Equipment Obligations		54,266.66
	4% CONSOLIDATED DEBENTURE STOCK.		
£32,225,428	Interest from July 1st, 1912	$6,273,216.64	
£ 739,434	Interest from Jan. 1st, 1913	71,971.55	
£ 581,143	Interest from July 1st, 1913		
		6,345,188.19	
	Less received from subsidy Northern Colonization Railway	8,000.00	6,337,188.19
			$10,876,352.15

EXHIBIT "C"

DETAILS OF BALANCE SHEET ITEM.

LANDS AND TOWNSITES.		
14,134,804 acres and Townsites sold, amounting to		$105,283,167.78
6,793,014 acres disposed of to the Dominion Government in 1886		10,189,521.00
		$115,472,688.78
LESS:—Expenses, Cultivation rebate and 10% on Land Grant Bonds retired and cancelled		12,462,331.77
		$103,010,357.01
ADD:—		
Proceeds Manitoba So. West. Col. Ry. Land Sales		$3,038,497.53
Proceeds Great North West. Cent. Ry. Land Sales		1,001,815.61
Proceeds Manitoba & North Western Ry. Land Sales		65,535.86
Proceeds British Columbia Land Sales		2,963,987.53
Proceeds Esquimalt & Nanaimo Ry. Land Sales		4,116,631.48
		$114,196,825.02
LESS:—Cost of lands purchased from Hudson's Bay Company	1,396,591.54	
Cost of land acquired with Esquimalt & Nanaimo Ry.	1,330,000.00	
		2,726,591.54
		$111,470,233.48
DEDUCT:—		
Expenditures on Irrigation		11,942,427.29
		$99,527,806.19
Amount expended in Construction of Railway and Equipment and deducted from cost of Property		36,193,521.00
		$63,334,285.19

EXHIBIT "D"

CONSTRUCTION—ACQUIRED AND BRANCH LINES.

Moosejaw N. W. Branch	$ 613,147.07
Craven-Bulyea Branch	6,037.40
Virden-McAuley Branch	103,274.05
Stonewall Branch Extension	94.40
Lauder Branch	196,467.44
Weyburn-Lethbridge Branch	2,293,337.52
Langdon Branch	Cr. 477.78
Kipp-Aldersyde Branch	61,554.62
Bassano-Irricana Branch	180,911.75
Regina-Colonsay Branch	180,528.82
Estevan-Forward Branch	483,201.34
Waldo-Galloway Branch	25,352.72
Moosejaw S. W. Branch	103,005.72
Wilkie N. W. Branch	74,667.92
Kerrobert N. E. Branch	404,564.95
Wilkie-Anglia Branch	97,092.79
Swift Current S. E. Branch	138,044.03
Swift Current N. W. Branch	1,412,370.58
Boissevain-Lauder Branch	106,134.34
Suffield S. W. Branch	824,817.64
Three Forks-Bear Lake Branch	85,464.23
Gimli-Riverton Branch	28,557.66
Bassano E. Branch	235,884.44
Snowflake W. Branch	8,549.36
Longue Pointe Extension, Montreal	1,115,533.45
Surveys of projected lines	334,933.75
	$9,113,050.21

EXHIBIT "E"

DETAILS OF EXPENDITURE ON ADDITIONS AND IMPROVEMENTS FROM JULY 1ST, 1912, TO JUNE 30TH, 1913.

MAIN LINE			
QUEBEC TO BONFIELD:			
Additional Sidings, Buildings, Stations and Yards	$ 157,064.63		
Permanent Bridges and Improvements of Line	239,535.34		
Right of Way	550.00		
			$ 397,149.97
MONTREAL TERMINALS			1,970,536.98
Windsor St. Station Extension			827,405.66
Double Track Bridge over St. Lawrence River			306,396.01
BONFIELD TO PORT ARTHUR:			
Additional Sidings, Buildings, Stations and Yards	625,022.79		
Permanent Bridges and Improvements of Line	365,554.08		
Double Tracking	2,018,997.64		
Right of Way	6,051.04		
			3,015,625.55
PORT ARTHUR TO FIELD:			
Additional Sidings, Buildings, Stations and Yards	1,161,046.76		
Permanent Bridges and Improvements of Line	797,487.76		
Winnipeg Station and Hotel	67,776.36		
Winnipeg Terminals	259,835.02		
Winnipeg New Elevator	347,252.23		
East Winnipeg Yard	2,075,355.21		
Fort William Terminals, including Coaling Plant	3,551,126.15		
Double Tracking	2,301,743.64		
Right of Way	Cr. 7,490.08		
Calgary Hotel	1,085,113.11		
			11,639,246.16
FIELD TO VANCOUVER:			
Additional Sidings, Buildings, Stations and Yards	327,116.37		
Permanent Bridges and Improvements of Line	584,592.52		
Vancouver Terminals	1,302,394.59		
Double Tracking	1,787,230.14		
Right of Way	783.88		
			4,002,117.50
Banff Springs Hotel Addition			1,206,875.92
Chateau Lake Louise			940,318.85
Empress Hotel, Victoria			599,225.75
Hotel Vancouver			660,584.34
Total Main Line			$25,565,482.69

BRANCH LINES:

South Western Branch	$ 5,537.49	
Stonewall Branch	3,470.57	
Selkirk Branch	6,816.88	
Emerson Branch	8,870.42	
Nakusp and Slocan Branch	416.13	
Revelstoke and Arrow Lake Branch	4,558.66	
Snowflake Branch	Cr. 7.55	
Waskada Branch	1.75	
St. Lin Branch	231.16	
Lake Temiskaming Branch	26,282.49	
MacGregor Branch	765.72	
Mission Branch	16,796.02	
Arcola-Regina Branch	84,674.64	
North Star Branch	Cr. 155.60	
Lac du Bonnet Branch	90.88	
Wolseley-Reston Branch	1,119.26	
Lachine Canal Branch	5,621.36	
Toronto-Sudbury Line	346,758.11	
Pleasant Hills Branch	225,357.47	
SOURIS BRANCH:		
Additional Sidings, Buildings, Stations and Yards	192,368.81	
Permanent Bridges and Improvements of Line	202,488.48	
Right of Way	334.65	
ALGOMA BRANCH:		
Additional Sidings, Buildings, Stations and Yards	66,257.21	
Permanent Bridges and Improvements of Line	33,671.22	
Grade Reduction	171,380.04	
CROWS NEST PASS BRANCH:		
Additional Sidings, Buildings, Stations and Yards	$ 47,297.56	
Permanent Bridges and Improvements of Line	198,388.50	
Right of Way	558.78	
	246,244.84	
CROWS NEST PASS BRANCH:		
McLeod-Lethbridge deviation	403.35	
BRITISH COLUMBIA SOUTHERN RY.:		
Additional Sidings, Buildings, Stations and Yards	21,040.68	
Permanent Bridges and Improvements of Line	26,312.84	
Right of Way	887.85	
Balfour Extension	4,293.29	
Yahk Branch	773.97	
	53,308.63	
		1,703,663.09
Telegraph Extensions and Additions		269,231.02
Office Building, Toronto		429,827.73
Office Building, Edmonton		229,417.35
Office Building, Saskatoon		184,711.15
Office Building Hamilton		112,980.05
Rented and Temporary Sidings		245,673.67
Total Main Line and Branches		$28,740,986.75

STATEMENT OF EARNINGS FOR THE YEAR ENDED JUNE 30TH, 1913.

From Passengers	$ 35,545,061.67
" Freight	89,655,223.33
" Mails	921,682.92
" Sleeping Cars, Express, Telegraph and Miscellaneous	13,273,732.06
Total	$139,395,699.98

STATEMENT OF WORKING EXPENSES FOR THE YEAR ENDED JUNE 30TH, 1913.

Transportation Expenses	$46,074,299.26
Maintenance of Way and Structures	18,498,741.05
Maintenance of Equipment	17,198,573.38
Traffic Expenses	3,376,980.85
Parlor and Sleeping Car Expenses	1,241,700.07
Expenses of Lake and River Steamers	1,113,808.10
General Expenses	3,953,769.74
Commercial Telegraph	1,691,953.38
Total	$93,149,825.83

STATEMENT OF SURPLUS INCOME ACCOUNT, JUNE 30TH, 1913.

Balance at June 30th, 1912		$72,885,966.34
Net earnings of Railway and Steamship Lines	$35,490,085.03	
Special Income (as per statements)	6,598,151.33	
		42,088,236.36
		114,974,202.70
Less: Dividends on Preference Stock, paid October 1st, 1912, and April 1st, 1913	2,807,288.47	
And dividends on Ordinary Stock, paid October 1st, 1912, January 2nd, 1913, April 1st, 1913, and June 30th, 1913	19,000,000.00	
And Interest on Instalments on New Stock Subscriptions, paid October 15th, 1912	569,813.87	
		22,377,102.34
		92,597,100.36
Amount applied on account of Additions and Improvements		15,000,000.00
Total Surplus Income, June 30th, 1913		$77,597,100.36
From this there have been declared the dividends on Preference and Ordinary Stock, payable October 1st, 1913, amounting to		6,486,626.79

APPROPRIATION FOR ADDITIONS AND IMPROVEMENTS.

Balance at June 30th, 1912	$ 3,535,712.14
Premium on issue $18,000,000.00 and on sale of $2,000,000.00 Ordinary Stock	11,750,647.81
Amount appropriated as authorized at Shareholders Meeting, October, 1912	15,000,000.00
	30,286,359.95
Less: Expended during year included in Exhibits "E" and "F" and for acquisition and development of the Company's Coal Mine Property	12,373,363.54
Amount unexpended	$17,912,996.41

TRAIN TRAFFIC STATISTICS—FOR TWELVE MONTHS ENDED JUNE 30TH, 1913 AND 1912.

EARNINGS OF LAKE AND RIVER STEAMERS NOT INCLUDED IN THIS STATEMENT.

	Year ended June 30th, 1913.	Year ended June 30th, 1912.	Increase or *Decrease.* Amount or number.	Per Cent.
TRAIN MILEAGE.				
Passenger trains	22,333,592	19,591,027	2,742,565	14.00
Freight "	27,611,103	25,638,692	1,972,411	7.69
Mixed "	1,888,095	1,727,792	160,303	9.28
Total trains	51,832,790	46,957.511	4,875,279	10.38
CAR MILEAGE.				
PASSENGER.				
Coaches and P. D. and S. cars	110,347,064	100,088.130	10,258,934	10.25
Combination cars	3,206,048	2,917,523	288,525	9.89
Baggage, Mail and Express cars	46,677,110	42,678,970	3,998,140	9.37
Total Passenger cars	160,230,222	145,684,623	14,545,599	9.98
FREIGHT.				
Loaded	581,397,285	556,244,798	25,152,487	4.52
Empty	165,627,992	140,210,180	25,417,812	18.13
Caboose	30,617,975	27,871,524	2,746,451	9.85
Total Freight cars	777,643,252	724.326,502	53,316,750	7.36
Passenger cars per Traffic Train Mile	6.62	6.83	.21	3.07
Freight cars per Traffic Train mile	26.36	26.47	.11	.42
PASSENGER TRAFFIC.				
Passengers carried (earning revenue)	15,298,048	13,593,569	1,704,479	12.54
Passengers carried (earning revenue) one mile	1,766,982,013	1,610,251,856	156,730,157	9.74
Passengers carried (earning revenue) one mile per mile of road	155,451	149,549	5,902	3.95
Average journey per passenger miles	115.51	118.46	2.95	2.49
Average amount received per passenger $	2.28	2.30	.02	.87
Average amount received per passenger mile cts.	1.97	1.94	.03	1.55
Average number of passengers per train mile	72.95	75.53	2.58	3.42
Average number of passengers per car mile	15.56	15.63	.07	.45
Revenue from passengers per passenger car mile, cts.	30.72	30.31	.41	1.35
Total passenger train earnings per train mile $	1.75	1.75	...	....
Total passenger train earnings per mile of road $	3,724.92	3,471.85	253.07	7.29
FREIGHT TRAFFIC.				
Tons of revenue freight carried one mile	11,242,690,998	10,180,782,322	1,061,908,676	10.43
Tons of non-rev. freight carried one mile	1,743,928,157	1,615,529,852	128,398,305	7.95
Total tons (all classes) frt. carried one mile	12,986,619,155	11,796,312,174	1,190,306,981	10.09
Tons of revenue freight carried one mile per mile of road	989,081	945.519	43,562	4.61
Tons of non-rev. freight carried one mile per mile of road	153.423	150.039	3,384	2.26
Total tons (all classes) freight carried one mile per mile of road	1,142,504	1,095,558	46,946	4.29
Average amount received per ton per mile of revenue freight, cts.	0.784	0.772	.012	1.55
Average No. of tons of revenue freight per train mile	381.12	372.02	9.10	2.45
Average No. of tons of non-rev. freight per train mile	59.12	59.03	.09	.15
Average No. of tons of (all classes) freight per train mile	440.24	431.05	9.19	2.13
Average No. of tons of revenue freight per loaded car mile	19.34	18.30	1.04	5.68
Average No. of tons of non-rev. freight per loaded car mile	3.00	2.91	.09	3.09
Average No. of tons of (all classes) freight per loaded car mile	22.34	21.21	1.13	5.33
Freight train earnings per loaded car mile, cts.	15.15	14.13	1.02	7.22
Freight train earnings per train mile $	2.99	2.87	.12	4.18
Freight train earnings per mile of road $	7,750.78	7,298.71	452.07	6.19